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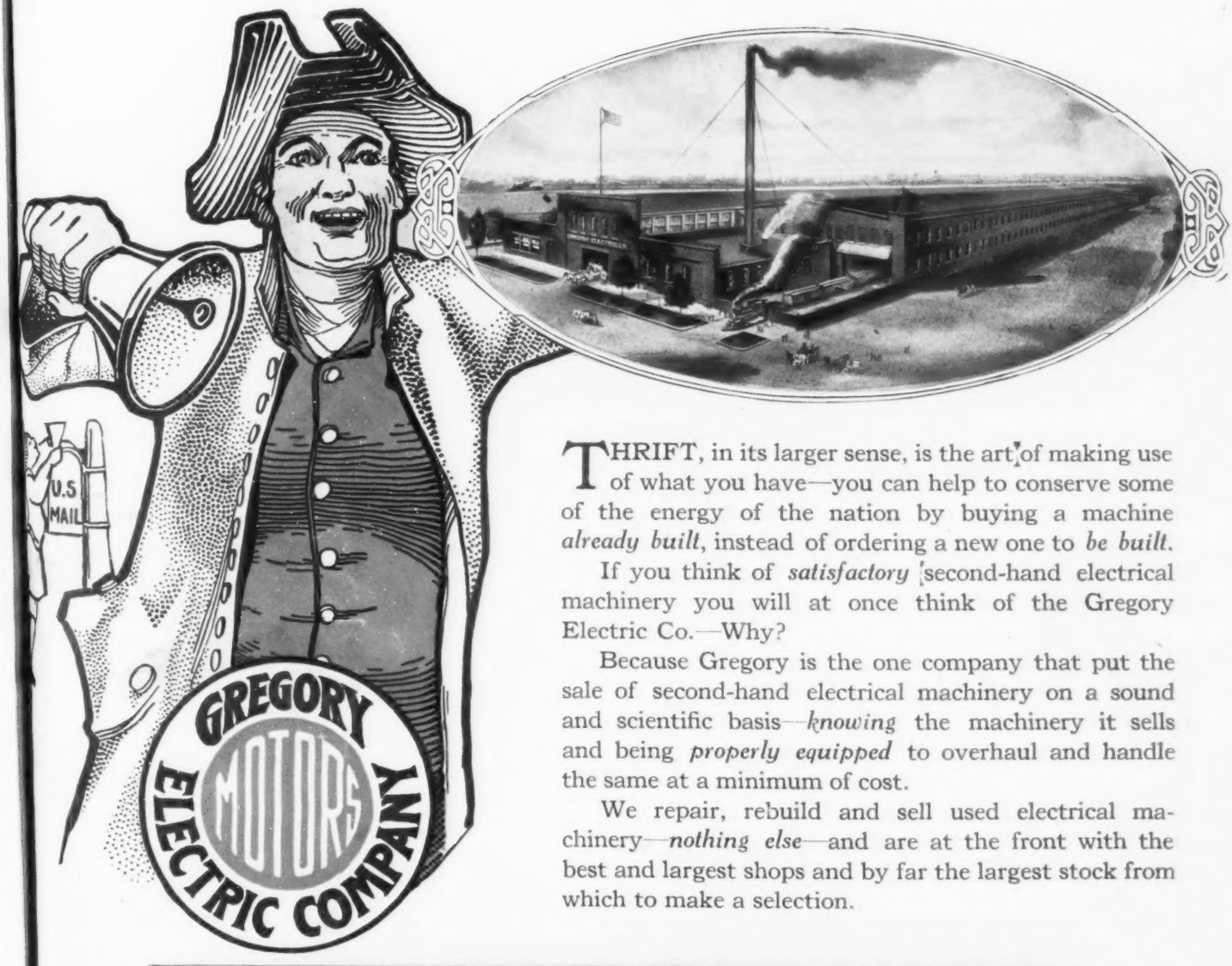

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Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

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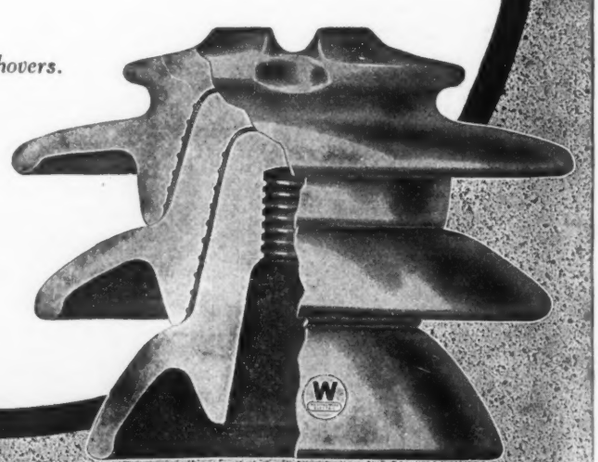

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

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Dawdling on Water Power

IT IS gradually dawning on the consciousness of legislators and the general public alike that coal is hard to get and that what there is of it will not last forever. Yet no one in authority seems to be worrying over the outlook. True, we have admonitions from the Fuel Administration to save coal by curtailing non-essential production and by burning the fuel efficiently, yet water-power legislation which would make immense coal savings possible still awaits action. Valuable water power is still running to waste and fuel more precious is being burned to obtain the power which the wasting water might supply. Meanwhile, there is the insistent cry of power shortage, but senators are obviously taken up with the sound of their own voices so that they cannot hear it, or if they do hear it, they are so out of touch with the actual conditions that they do not appreciate how acute the situation is. The Senate is opposed to many of the features of the administration water-power bill now in its hands, but it is quite dilatory in making its opposition known and enacting a measure for which the country is patiently awaiting. While its committee dawdles along with the measure committed to it, there are in almost every district object lessons setting out the folly of inaction. Power companies can make bricks if the straw and clay are not withheld.

Utilities and Daylight Saving

WHILE it undoubtedly would have been to the advantage of many lighting companies to have daylight saving extended throughout the year, it would be very difficult to prove that it would have been of any advantage whatsoever to the hundred million inhabitants of the United States. Any suggestion, therefore, to extend it beyond the last Sunday in October would be bound to be unpopular, and electric lighting companies were wise in not appearing openly as ardent advocates of Senator Calder's proposed resolution. Certainly, any slight advantage would never compensate a company for the prestige it would lose through such espousal or for the actual hindrance it would encounter in all directions owing to popular prejudice. Good will is very hard to get and is too valuable an asset to throw away on such a trifling matter as daylight saving. No public utility wishes to deny to the general public any great advantage because it would entail some sacrifice on the part of a utility. All must work for the general good, and what is not for the general good of the nation is not, in the long run, for the general good of any industry.

Developing Engineers of Character and Judgment

DR. CHARLES R. MANN in his report on engineering education suggests that 95 per cent of the engineers think the character and judgment of the young men they are to employ more important than knowledge and technique. It is worth while, then, to consider the remedies which he proposes for any deficiencies along these lines apparent in educational training. One of the most valuable of these remedies lies in the suggestion that certain tests be applied to a student before matriculation which will show whether he has the mental ability required. Professor Thorndike applied such tests to a group of thirty-four men entering Columbia University and discovered that it was quite possible to forecast the records which these students subsequently made. Teachers, too, commonly find that it usually does not take long to "size up" a student. Instead, therefore, of permitting young men from the high schools to enter college on the basis of certain subjects studied, it would seem better to set about taking the measure in a businesslike way to see whether they are on the right track. This would save much of the effort required and grief incurred in weeding them out. Men who lack common sense can scarcely acquire it and should be eliminated at the start, and the same scheme of examination is advocated for use with the upper classmen as well.

It is Dr. Mann's opinion also that colleges are missing a real opportunity in overlooking the possibility of using industrial shops for engineering laboratories. He points out the work being done by certain coöperative engineering schools, notably the University of Cincinnati, where the student mixes with the workmen and gets their point of view as he might never get it in any other way. This is certainly of the highest importance if, as Dr. Mann believes, the chief object of the engineer is to increase production. It is further suggested that engineering problems, including the important elements of value and costs, be assigned to the classes. Students in electrical engineering, for instance, should be asked to decide which is the best of three motors for the price rather than to measure the efficiency of a motor. Unquestionably one would prefer to employ a man who could choose the best motor for the price, but it is not certain that he could do so without first learning to measure the efficiency of a motor. Whether the cooperative scheme be correct or not, the value of actual engineering work along with a college education cannot be doubted since men with this experience make the best students.

The matter of developing character has so far been entirely independent of the curriculum. Much may

be done to inspire the students individually and a great deal may be accomplished by developing high ideals. The humanistic studies, so sadly neglected in many engineering schools, will do much to strengthen character and broaden the concepts of students. It is a pleasure, therefore, to note the increase in the emphasis placed upon the humanities and humanistic studies. Above all else we need broad-minded men and not narrowed mechanicians, and the present report is especially welcome because it is wider in its concept of these matters than its title would imply. Educators of all kinds will find Dr. Mann's report very profitable reading.

A Notable Steam Transmission Plant

ONE of the interesting features of the growth of electric power transmission has been the steadily increasing use of steam plants as a secondary source of supply in connection with the hydroelectric plant originally developed. It is hardly fair to call many of the steam plants now in use by the title of auxiliary plants. They are not auxiliary in the usual sense of being merely used in an emergency or turned on to eke out failing water. They are rather for the purpose of enabling hydroelectric resources to be utilized to the fullest extent. The weak point of all hydroelectric propositions is the variation of the flow, which many times exceeds for short periods the average flow and still more the low-water flow. The earlier hydraulic engineers have been wont to divide their possible output into primary and secondary power—the former that which was available all the time, the latter that which was generally available but subject to interruption or reduction for a material portion of the year's run. Now, a hydroelectric plant to take the best advantage of its flow must include a considerably larger capacity than is available purely as primary power, and the modern steam stations—secondary stations we have here called them— are intended to deal fully and efficiently with the upkeep of secondary power and not merely to serve in case of breakdown or to defend the system against complete collapse at times of exceptionally low water. They are therefore planned for the efficient production of large quantities of energy for a considerable portion of the year's running time and have to be designed for high efficiency rather than for minimum overhead like the auxiliary plants of earlier days.

We describe this week an excellent example of such a steam plant built to operate in conjunction with the hydroelectric system of the Turners Falls Power & Electric Company, which operates in the central Connecticut valley. This is now about to be placed in operation, with 30,000 kw. in two units. A few years ago the operation of only two units in a steam plant would have been frowned upon, but here, as in all other cases of transmission networks, the advantageous size of units is determined, not by the theoretical requirements of any one station, but as a part of the equipment of the whole system. The new plant, situated at Chicopee Junction, is designed with high efficiency especially in view. Its boiler units are big—eight mechanically stoked boilers furnishing the whole output, and the condensing and coal-handling systems are planned to get the most possible out of the fuel. There is extensive use of motor-driven auxiliaries, and every precaution has been taken to bring the plant to the highest point of economical operation. The requirements of coal supply and water condensation made it advisable to build the plant on a site where especial care had to be taken with the foundations, another instance of the wisdom of adjusting conditions for economical operation, even at extra first cost. Good judgment, too, was shown in giving liberal space for all the apparatus. Crowding is sometimes necessary, but never desirable. An important feature of the plant is an ample amount of coal-storage capacity, sufficient to operate the plant at its rating for three months when fully utilized. Electrically the plant represents a design entirely coherent with the existing system, generating at 13,200 volts and transmission at 66,000 volts, Y-connected with grounded neutral. The transmission voltage is derived from an outdoor substation, sufficient evidence that the day of costly and complicated transformer houses is near its end even in our northern climate. Altogether the new plant is a capital example of advanced practice and should prove extremely valuable to the great transmission system which it feeds.

The Power-Factor Problem

IN THESE times, when generating capacity is being taxed to its utmost, the ever-present but sometimes half-forgotten matter of power factor comes to the front. Will Brown's paper in the current issue puts very forcibly before the reader the real gravity of the situation which arises from the thoughtless or ignorant use of machines which keep the power factor of the system so low as to cause grave reduction in its working capacity and considerable increase in the losses. As Mr. Brown pictures it, a great and increasing pile of electric machinery, line wire and equipment lies practically useless by reason of operating at reduced power factor. A 1000-kw. generator at low power factor may be capable of doing no more than 500 kw. or 600 kw. worth of actual work, and that at lowered efficiency. The case would be just as bad as if a 400-kw. or 500-kw. generator were crippled and lying idle. Mr. Brown quotes half a dozen cases in which the power factor was actually found to be down to 50 or 60 per cent, and on plants operating considerable motor load this condition is actually a common one. The worst of it is that not only is the central station hampered but the motors themselves are working at comparatively low efficiency, else in most cases they would not be showing low power factor.

As a rule, the power factor of modern induction motors operated at or near load can be held up to the neighborhood of 80 per cent, often exceeding it. Low power factor is not due to poorly designed motors so much as to poor engineering in their installation. In earlier days bad induction motors were common, but at present there is no excuse for their use at all. Indeed, save for exceptional cases of abnormally low speed or very peculiar load conditions, it is not easy to find a motor which really performs badly at full load. Most of the trouble comes from running unnecessarily large motors with badly distributed load, and this means loss to the consumer as well as to the producer of electric

power. There are, of course, some familiar remedial measures, like the use of synchronous motors and of synchronous condensers, which will permit the correction of power factor without the delay incident to replanning the existing induction-motor drives.

Mr. Brown believes—and many central-station men will agree with him—that more restrictions ought to be placed on load involving low power factor. It was a mooted question in the early days of electrical transmission whether, considering the seriousness of the matter, it might not be wise to furnish energy for induction motors on an ampere-hour basis. The same question in a somewhat modified form arises to-day, and it has not infrequently been found necessary to enforce by one means or another measures penalizing low power factor, or, what amounts to the same thing, favoring the customer with high power factor. There is, however, no general agreement as to the best way of dealing with the difficulty, and we hope that Mr. Brown's articles on the subject will lead to definite and widespread action to relieve the situation.

War-Time Lighting Economies

THE report on this topic by the committee on war service of the Illuminating Engineering Society is a most suggestive and important discussion of real economic measures as contradistinguished from those chiefly concerned with catching the public eye. The recommendations made by the committee with respect to the elimination of waste and the more effective use of daylight are in themselves amply sufficient to accomplish all the saving really advantageous to the community in the matter of artificial lighting. A possible exception may be made with respect to the use of artificial light for advertising purposes, but, as the committee plainly states, this is intrinsically merely a part of the general situation with respect to the waste of money and material in garish competitive displays which the powers that be have as yet shown no symptoms whatever of attempting to curtail. If the users of artificial light set themselves rigorously to follow the recommendations of the I. E. S. committee, they will not only very materially reduce the amount of fuel needed for the sum total of artificial lighting, but will also reduce their personal bills to a very perceptible extent.

Perhaps the strongest single practical point made in the report is that which deals with the desirability of using only such lamps as are necessary, cutting down, not the illumination, generally none too high, but the area lighted. A very casual inspection of any residence region shows that to-day, even in war time, many unnecessary lamps are in use, illuminating a much greater area than anything which can be fairly held to be actually required.

Turning from this matter, we reach another to which the committee directs attention in the waste of light in shops. The experience of the last few years has very clearly proved that store lighting is a competitive rather than a utilitarian proposition. The enterprising shopkeeper sets his windows ablaze and his bargain counters into bold relief by lighting sometimes excessive in the hope that thereby he may strike the consumer's eye more vigorously than his competitor. We ought by this time to be far enough from the "business as usual" point of view to realize the nature of this situation and to settle down upon a strictly businesslike basis of illuminating for practical usefulness rather than for display.

In industrial work opportunities for saving artificial light are rather meager. Most factories are now underlighted rather than overlighted, and, aside from the general suggestions made by the committee on using efficient illuminants skillfully, not much is to be accomplished, especially in these times when night shifts are increasingly common. To tell the truth, we look with some disapproval on the minimum illuminations suggested by the committee for manufacturing purposes. For certain kinds of work 3 foot-candles may be and doubtless is enough, but, taking the higher grade of industrial operations as a whole, we are convinced that reduction of light to this amount would materially impede production, probably to an extent which would more than offset, when reduced to actual fuel consumption, anything that would be gained by approaching a minimum of 3 foot-candles in the lighting.

In industries necessary to the carrying on of the war results are of the first order of importance, and it is far better to save fuel if necessary by the elimination of non-essential industries than by crippling even to a small extent those that are essential. The actual saving in coal by the reduction of lighting after the ordinary sources of waste are eliminated is so trivial as hardly to be worth considering when one bears in mind the very probable losses of human efficiency. The most that can be said for the somewhat extreme measures aimed at by the Fuel Administration is that, from the conspicuousness of the deficit, they make a brave showing of an immaterial conservation; and, frankly, we do not believe in the methods of the publicity manager in solving technical and financial problems of the most serious importance to the community. In our alleged efforts at conservation there has been far too little of careful analysis of the conditions and forceful remedial measures. The war is not over, despite the made-in-Germany scare headlines, and this is the very time at which persistent and unostentatious hard work has the greatest value to the nation.

The Coming Issues

ADDITIONAL features of the new Dayton steam station will be described in an early issue. Particular attention will be given to the electrical part of the plant, which has been designed to permit great flexibility of operation. Another article will describe an interconnection in the Far West that makes possible the most economical use of water power. Different measures of economy are being taken by the Southern California Edison Company, and these will also be outlined. A brief account will be given of steps taken by another company to develop water power hitherto not utilized by installing induction generators. Problems involved in improving power factor, the urgency of which is discussed in this issue by Will Brown, will be discussed in further detail in later issues.

Plant Arrangement and Costs of Construction—I

Features of Latest Station of Turners Falls Power & Electric Company, Which Bids Fair to Be One of the Most Important Steam Plants in the New England States

A NEW steam plant, to cost $2,215,000, with an initial installation of 30,000 kw. in two turbo-generators, will soon be placed in operation at Chicopee Junction, Mass., by the Turners Falls Power & Electric Company, which operates nearly 500 miles (800 km.) of transmission and distribution lines in the central Connecticut Valley. The Montague City hydroelectric plant of this company, previously described in the ELECTRICAL WORLD, has now been developed to its full capacity of 45,000 kw., but the growth of load on the system has been so rapid during the last two years that the establishment of a steam station was seen to be necessary even before the completion of the former. The company supplies energy to many important industrial concerns, to central stations and electric railways, the Springfield Street Railway having recently entered into a contract for service over a thirty-year period.

Investigations showed that the steam plant should logically be situated at the southerly end of the system, and four different sites were considered, taking into account particularly the growth of load, connection with the existing transmission system, availability of water for condensing and feed purposes, transportation of coal, coal storage and cost of site. The site finally selected is at the junction of the Connecticut and Chicopee Rivers, about 4 miles (6 km.) from the center of Springfield. It includes about 40 acres (16 hectares), is well provided with railroad facilities and is almost ideally situated for the future delivery of coal by water when the Connecticut River is made navigable to Holyoke or points adjacent thereto. The site is also well situated with respect to the existing transmission lines of the company and center of its present load, and it is in the heart of an important industrial district which is an excellent field for future development. Immediately upon the grant of authority to purchase the necessary land equipment orders were placed on a priority basis, excavation and development of the site were started, and work on the design and plans was rapidly carried forward. Construction was begun in May, 1917, and was practically completed by June 1, 1918. The site was cleared of timber, access roads were constructed, foundations were built, and the structural steel frame was erected to allow for the installation of boilers after a period of seven months. The structure of the building was inclosed sufficiently to protect workmen engaged in installing equipment after a period of nine months. The substructure and building were carried forward almost simultaneously with the plans and designs, which was necessary to secure the completion of the project when needed. The first generating unit was put into service in September of the present year.

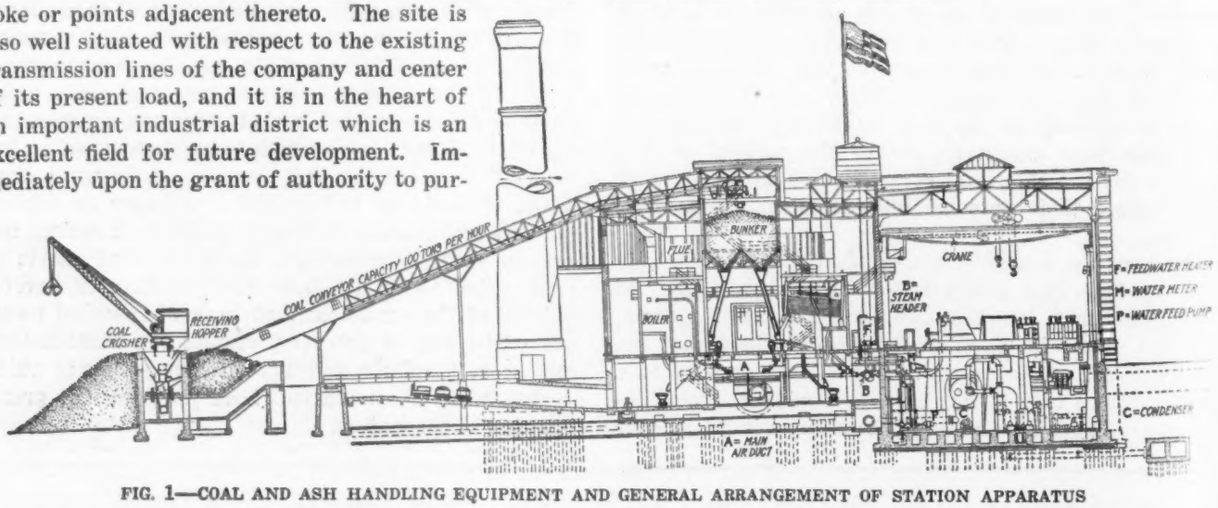


FIG. 1—COAL AND ASH HANDLING EQUIPMENT AND GENERAL ARRANGEMENT OF STATION APPARATUS

DESCRIPTION OF EQUIPMENT

The principal equipment of the plant consists of eight 652-hp. Edge Moor water-tube boilers equipped with Riley stokers; two 15,000-kw. General Electric turbines designed for 200 lb. (14 kg. per sq.cm.) working pressure and driving three-phase, 60-cycle generators rated at 13,200 volts; jet condensing equipment furnished by the C. H. Wheeler Manufacturing Company and including "Radojet" ejectors; a coal-handling system of the Stephens-Adamson Company's design; an Alphons-Custodis chimney; two Warren Webster feed-water heaters and purifiers; six 6250-kva. Westinghouse outdoor-type transformers, which raise the potential of the generator output for transmission to 66,000 volts; a Brown-hoist electrically operated locomotive crane for yard service; a forced-draft system operated by Green fans driven by Terry turbines and by motors; a 60-ton Whiting electric crane for turbine-room service; a Merrick weightometer for coal service, and various auxiliary apparatus.

Points of special interest in the station design are the provision for coal supply and storage; the coal-handling system, condensing system, arrangement of the station for expansion; extensive use of motor-driven auxiliary equipment; protection of the station against high water in the Connecticut River, and the outdoor substation by which the plant is tied into the 66,000-

volt transmission system of the company. The plant is by no means a mere stand-by installation which will be operated only at seasons of low water in the Connecticut River; it is to be handled in connection with the other stations of the company so as to secure the best all-around efficiency of the system, and is accordingly designed for economical service along the lines of the best modern practice. This station bids

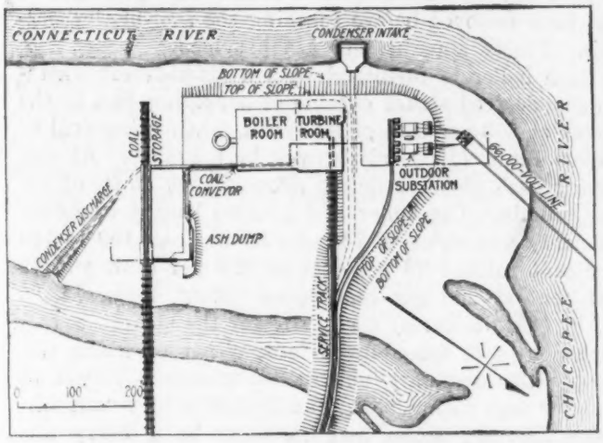


FIG. 2—CONDITIONS AND FACILITIES SURROUNDING HAMPDEN STATION

fair to become one of the most important steam plants in Massachusetts in relation to future load developments and system interconnections.

The station is in the city of Chicopee and is known as the Hampden plant of the company. It is about 2000 ft. (610 m.) from the Chicopee Junction station of the Boston & Maine Railroad. For construction a single-track connection was made with the railroad, branching on the property into two lines, one being carried over a timber and concrete trestle for the storage of coal, and the other, a service track on a roadway embankment and wooden trestle, connecting with the turbine room of the station and used in the transportation of machinery and supplies. About 7000 ft. (2150 m.) of tracks, turnouts and spurs were constructed, and a standard-gage Boston & Maine locomotive and crew have been required for switching in cars of building material, equipment and coal. The general arrangement of railroad tracks is shown in the accompanying plan of the station property, the coal trestle being shown at the right of the station and the machinery, material and general supply line near the north end of the building. A trestle 1077 ft. (3290 m.) long was required for the free dumping and storage of coal, and the entire cost of wooden and concrete trestle, service track to the turbine room and construction railroad used during the period of erection was about $132,000. The total storage capacity of the present coal field is about 36,000 tons at a depth of 10 ft. (3 m.).

A portion of the land on which the plant and its connections are built is flooded at times of high water in the Connecticut River. The grounds around the station and a permanent highway connection on which there is a service railroad track have been brought to an elevation above the highest known water level. Filling was obtained from a borrow pit across the Chicopee River and cinders for this purpose were obtained from the railroad company.

Owing to the character of the material underlying the plant it was necessary to support the station structure on a concrete pile foundation. About 1000 Raymond concrete piles were driven, each of which is designed to carry 30 tons of building load including its equipment. Beneath the turbine-room operating floor is a basement with floor at an elevation just above extreme low water in the Connecticut River. At times of high water this basement would be entirely surrounded by ground water, which necessitated the most careful construction. Between the tops of the piles and the basement floor is a system of heavy concrete beams reinforced with steel, carrying the downward loads of the building and sustaining the pressure of water from beneath. Water is excluded by a membrane similar to that used in the subway construction in the cities of New York and Boston. The operating floor of both the boiler and turbine rooms is 30 ft. (9 m.) above the turbine-room basement floor; below this concrete construction has been used throughout. The total cost of excavation, concrete pile foundation, underdrains, floors, concrete building walls, etc., was about $237,000. About 1400 ft. (425 m.) of borings were made in studying the site. The pressure beneath the basement floor at the maximum stage of the Connecticut River is about 1400 lb. per square foot (6850 kg. per sq.m.).

Above the concrete foundation and the operating floor has been constructed a superstructure consisting of brick walls, with a concrete roof and a structural steel frame. A panel of tile is provided just above the operating floor of the turbine room. The total cost of the superstructure was about $247,000.

While the station design follows the usual practice, it is unusually liberal in spacing. The boiler room is about 102 ft. (31 m.) square, the turbine room being 79 ft. by 109 ft. (24 m. by 33 m.) in plan. Condensing equipment, feed pumps, sump pumps and an air-compressor are installed in the turbine-room basement, which is high enough to provide good spacing for piping and accessories. The fan system for stoker service

FIG. 3—CONVEYOR THAT DISTRIBUTES COAL IN OVERHEAD BUNKER

and the ash-handling equipment, main air duct and steam header are in the boiler-room basement, the feed-water heaters being within the boiler room close to the turbine room wall and near the floor level. The condensing water supply and discharge is carried through the station in an unusually direct run of piping and conduit, as shown in the accompanying cross-sec-

tion. The location of the boiler-feed pumps between the condenser hot wells and the feed-water heater units, as shown, enabled short pipe runs to be provided. A noteworthy feature of the station design is the running of the main high-pressure steam piping from the boiler outlets downward across the basement to a header from which the turbine supply is taken. This arrangement leaves the boiler room clear and results in minimum cost for pipe of the larger diameters.

The coal-handling system includes ground storage facilities and a trestle, approximately 1200 ft. (365 m.) long and from 15 ft to 30 ft. (4.5 m. to 9 m.) high. This storage is filled by gravity from bottom-dump cars. A locomotive crane operated on the trestle is used for spreading the coal and for reclamation purposes. The capacity of the storage yard, in which fuel is piled to a depth of 10 ft. (3 m.), is sufficient to operate the present plant of 30,000 kw. rating for about three months at 100 per cent load factor, assuming an efficiency of 2 lb. (900 gm.) per kilowatt-hour. The locomotive crane will haul two loaded cars on the trestle and has a capacity of 60 tons to 75 tons per hour. It is operated by 550-volt, three-phase energy.

System of Handling Coal

Coal is delivered from the cars or from the hoist bucket into a receiving hopper in the trestle, and thence is delivered to a crusher beneath by a reciprocating roller-plate feeder designed to regulate the flow of fuel at the desired rate. The crusher is driven by a 30-hp. motor, a 4-hp. motor operating the feeder. At the lower end of the feeder is a hinged bar designed to pick out the "fines" and deliver them to a cross-belt conveyor leading to the main conveyor, thus reducing the work required of the crusher. The sized coal is fed to a 24-in. cross-belt conveyor driven by a 10-hp. motor. This conveyor runs through a concrete tunnel under the trestle, carrying the coal a distance of approximately 150 ft. (45 m.) and adding 150 ft. (45 m.) of storage for empty cars on the trestle as they are dumped into the receiving hopper. At the end of the cross belt the coal is fed into a main belt conveyor also 24 in. (60 cm.) wide and driven by a 20-hp. motor. This conveyor carries the fuel to the top of the boiler house and in turn delivers it to a horizontal belt conveyor driven by a 10-hp. motor and distributing coal by a belt tripper into the bunkers. The crusher and belt conveyors have a maximum capacity of 100 tons per hour, and the overhead bunkers have a capacity of 1000 tons. On the first section of the belt conveyor is an automatic weightometer which records the weight of all entering fuel. From the bunkers the coal flows by gravity through the bunker gates and stoker spouts into the stoker hoppers, as indicated in the cross-section diagram. The conveyor belts are made of rubber.

There are eight boilers, each being equipped with an Edge Moor mechanical intra-baffle soot blower and designed to operate at 225 lb. (15.75 kg.) steam pressure with from 125 deg. to 150 deg. Fahr. (52 to 65 deg. C.) superheat. The boilers are set in four batteries of two each; the usual tube-dusting doors have been omitted, thereby saving losses from air leakage. Chain-operated corrugated doors are provided across the boiler fronts. Numerous diagonal pipes installed among the tubes and connected to a header within the setting supply steam to the soot-blowing nozzles. The latter discharge high-velocity superheated steam along the tubes and in general parallel to them, effectively dislodging the soot. In the first two passes these pipes are installed within and are protected by the baffles themselves; in the third pass the pipes are placed aginst the rear-header tube plate and are protected by thick layers of hot-blast cement. A drain is provided for each header to insure that all moisture has been removed before reaching the soot-blower nozzles. Foster superheaters are provided.

Each boiler is furnished with a seven-retort, extra-long underfeed stoker capable of supplying fuel to the boiler at 300 per cent of its rating when using coal of 14,000 B.t.u. (1600 calories per kg.) quality. At this rating each stoker requires about 25,500 cu.ft. of air per minute. The boiler and furnace have a combined efficiency guarantee of 76 per cent at from 100 to 150 per cent rating; 73 per cent at 200 per cent, and 70 per cent at 250 per cent boiler rating, using 14,000 B.t.u. (1600 calories) coal. Air for the stokers is furnished by two forced-draft fans, either of which will supply the necessary volume to drive six boilers at 300 per cent rating. One fan is driven by a variable-speed slip-ring motor and the other by a Terry turbine. Both are installed in the boiler-room basement

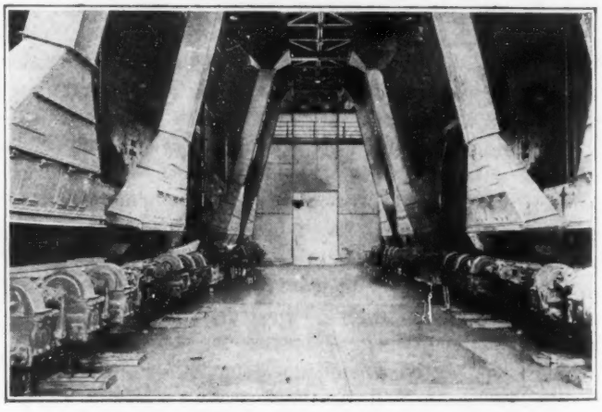


FIG. 4—UNDERFEED-STOKER EQUIPPED BOILERS IN NEW ENGLAND PLANT

directly below the duct lines from which branches are taken to the stoker wind boxes. Air from the generator casings and turbine room is available for furnace service. Either fan will deliver 100,000 cu.ft. (2800 cu.m.) of air per minute against 6 in. (125 mm.) static pressure.

The ashes and refuse from the stokers fall by gravity into large hoppers directly under the stokers and from these are discharged into 1-ton steel tip cars. These are hauled out of the boiler-room basement and up a ramp to a temporary trestle leading to portions of the property needing filling, the haulage being by an Elwell-Parker industrial tractor of 2 tons rating.

The products of combustion are carried away from the boilers by uptakes connecting with a horizontal flue discharging into the stack at the bunker level. The stack, which is 250 ft. (76 m.) high and 13 ft. (4 m.) in diameter, was built upon a concrete pile foundation, and its cost was $28,230, itemized as follows: Excavation, $240; concrete piles, $4,477; base, $5,856; brick shaft, $17,657.

Education Needed for Present Engineering Demands

Abstract of Dr. Mann's Report on His Three-Year Study of Engineering Education—Standard Curriculum Is Not Proposed, but Rather a "Common Core" on Which Courses Can Be Built

For more than three years Dr. Mann has been making a study of engineering education under the joint auspices of the Carnegie Foundation for the Advancement of Teaching and the joint committee on engineering education of the national engineering societies. In 1907 the Society for the Promotion of Engineering Education invited the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Chemical Society to join it in the formation of a joint committee to examine into all branches of engineering education. The next year the Carnegie Foundation was invited to appoint delegates to the committee, and subsequently the Carnegie Foundation undertook to carry out the investigation on a large scale and bear the expense of it. Dr. Mann was retained to give his entire time to it. The committee has been closely associated with Dr. Mann during the work.

The following signers of the introduction constitute the committee: Desmond FitzGerald, Onward Bates and Daniel W. Mead, for the American Society of Civil Engineers; F. H. Clark and Fred J. Miller, for the American Society of Mechanical Engineers; C. F. Scott and Samuel Sheldon, for the American Institute of Electrical Engineers; Clifford Richardson and Henry P. Talbot, for the American Chemical Society; J. R. Withrow, for the American Institute of Chemical Engineers; Henry M. Howe and John Hays Hammond, for the American Institute of Mining Engineers, and D. C. Jackson, G. C. Anthony and C. R. Richards, for the Society for the Promotion of Engineering Education. Henry S. Pritchett is president of the Carnegie Foundation.

ENGINEERING education in its primary conception is a means by which production can be increased. This, the belief of Dr. Charles R. Mann, dominates the comprehensive report he has just made on engineering education. From that principle he argues that knowledge of the human factor in production is as important as that of materials, and his investigation indicates that engineering schools treat of materials extensively but not of the human element. He also finds a need for much more instruction in the appraising of values and costs. What he proposes is not a standard curriculum, but a method by which engineering schools can construct courses to meet present-day demands, coupled with a more rational means of testing and grading the abilities of the students before admission and throughout the courses, thus directing them with greater certainty to the specialty for which they are best fitted.

The method Dr. Mann proposes for the actual formulation of the courses is to have in each school a standing committee which shall decide what he calls the "common core" of all engineering education, no matter what the specialty. This "core" being defined with reference to the needs of the engineer, the committee would determine the time necessary to cover it adequately and would shape the courses accordingly, instead of arbitrarily parceling off to the different departments the time predetermined as available and letting each department crowd as much as possible into its allotted time. The "common core" would have studies under four main heads: (1) Participation in real industrial work; (2) engineering laboratory work, including drawing and descriptive geometry; (3) mathematics and science, and (4) humanistic studies. Participation in industrial work would best be interwoven with the three classroom and laboratory divisions of the student's work, and as an example of what can be accomplished in this line, Dr. Mann indorses emphatically the coöperative system of engineering education developed at the University of Cincinnati and since applied at other institutions.

At the beginning of the course and while giving the "common core" studies the testing and grading methods already referred to would be given.

COMPREHENSIVE COMMITTEE SYSTEM

In addition to the standing committee to take care of the "common core" studies, there should be additional committees, one for each of the semi-specialties offered at the school, such as civil, electrical and chemical engineering. Here the same method would apply; that is, the committee, having a clear-cut conception of the demands of present-day engineering, would determine first the equipment needed by young graduates and then the time required to obtain that equipment, and would develop the courses accordingly. This semi-specialized work would follow the "common core" studies, and again grading and testing methods would be used which would indicate the relationship between academic attainments and the qualities needed for success in engineering work and would be a guide in choosing further specialization.

A clear conception of the spirit of Dr. Mann's study and of the line of reasoning which has led to his conclusions can best be obtained from the chapter of his report entitled "The Professional Engineer." From this chapter the following paragraph is taken:

> Because the engineering schools have always made it their chief aim to impart the technical information needed in industrial production, and because both scientific knowledge and industrial practice have grown so rapidly, the attention of technical schools has been focused chiefly on keeping up to date in science and practice. The university emphasis on research in natural science has also tended to magnify the importance of technique and to minimize the importance of personality. . . . Therefore it seemed necessary to consider the question whether this emphasis on technique is producing a new and higher type of engineer, or whether the engineering profession still stakes its faith on the fundamental thesis that personal character is, after all, the real foundation for achievement.

To arrive at the requirements of the engineering profession an extensive inquiry was made. Circular letters were sent to engineers throughout the country, asking them what they deemed the most important factors in determining probable success or failure in engineering. In the replies received personal qualities were mentioned seven times as frequently as knowledge of engineering science and the technique of practice. Of six groups of qualities headed respectively "character,"

"judgment," "efficiency," "understanding of men," "knowledge" and "technique," the summarized votes of more than 7000 engineers placed character at the head of the list by a majority of 94.5 per cent, and technique at the bottom by an equally decisive majority.

Thus it appears that even before our entry into the war—for the inquiry described was completed in 1916—there was keen appreciation of the importance of the personality of the engineer. Since then Dr. Mann thinks events have brought out that need even more clearly. Further quotation from his chapter on "The Professional Engineer" indicate this tendency:

> The training of men for the solution of human problems connected with industrial work cannot be carried out in the schoolroom alone. The students must have some vital, first-hand, personal contact with labor and workmen's conditions, either by a coöperative system, as at the Universities of Cincinnati and of Pittsburgh, or through the industrial service movement, or in some other real and living way. Hence meeting this demand requires some form of closer coöperation between the engineering school and the industries, better understanding of their mutual relations, and willingness on both sides to approach the problem with the true research spirit. Such coöperation is needed not only to give the students a vital conception of the workman's point of view, but also to furnish that intimate personal knowledge of the details of production which cannot be secured in college laboratories and shops. The lack of this sense of the physical properties of materials is one of the chief reasons why less than 5 per cent of the production managers in this country are college-trained men.
>
> It is, however, in the matter of estimating values and costs that this problem assumes its most far-reaching consequences. The following are some of the typical problems now pressing for solution in this field:
>
> What is the effect of good housing on the development of the men, the efficiency of production and the size of the profits? What is the most effective incentive to maximum output—the bonus system? opportunity for coöperation in management? opportunity for creative work? or shorter hours? Does the assurance of justice and a square deal always tend to increase output and also to foster the growth of a social spirit and of patriotism? Does a plant pay better when profits and output are increased by efficiency methods which give workmen no chance for self-expression, or when the development of the workmen is made an aim as well? . . .
>
> The organization of curricula proposed is suggested as one practical method of harmonizing the conflicting demands of technical skill and liberal education. It coördinates the results of numerous individual experiments in a consistent program. It recognizes all the essential elements and factors of engineering as well as the educational requirements of motivation and interrelation. It is not a utopian dream, but a summation of the best that has been thought, said and done in education during the past two centuries. Finally, it embodies the modern conception of the professional engineer, not as a conglomerate of classical scholarship and mechanical skill, but as the creator of machines and the interpreter of their human significance, well qualified to increase the material rewards of human labor and to organize industry for the more intelligent development of men.

Present Systems of Admission Faulty

Discussing the problems of engineering education as he sees them, Dr. Mann points it out as evident that when 60 out of every 100 of those admitted to engineering schools fail to continue through the course the present systems of admission, whether by examination or by certificate, are not satisfactory. Obviously, a fairly large number of students who ought not to try to become engineers are permitted to undertake studies for which they have little natural ability.

The determination of a candidate's fitness to enter college depends ultimately, Dr. Mann concedes, on tests of some sort; and as tending to eliminate the fallacies and vagaries of individual personal judgment and make grading more a measure of ability and less an expression of conformity to the conviction of an individual, Dr. Mann cites a series of experiments made by Prof. Edward L. Thorndike of Columbia University. Thirty-four students were asked, among other things, to read paragraphs and answer questions as to their meaning, to supply missing words in sentences, to solve mathematical problems, to draw graphs from given data, to match each of a series of pictures with one of a series of verbal statements, and to construct simple mechanical devices from their unassembled parts. Each test was constructed as a series of graded steps of increasing difficulty, the first being so easy that every one was sure to accomplish it and the last so difficult that only the ablest could master it. The questions as a rule could not be answered from memory and were of a kind that had to be answered by a short, unambiguous statement. Independent scorers in the tests repeatedly gave practically identical ratings.

The records of the thirty-four men tested have been followed for three years. Five of the seven who stood highest received general honors, while five of the seven lowest in the test failed in more than half of their work and left school.

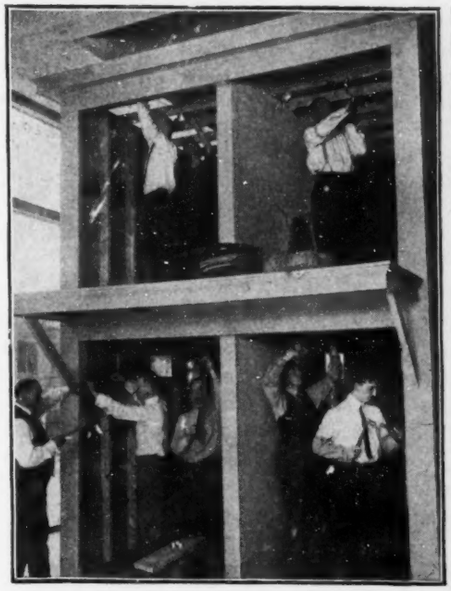
Similar tests were made by Professor Thorndike at other schools, with results that prophesied academic achievements as accurately as the college ratings for one year prophesied those for the succeeding year.

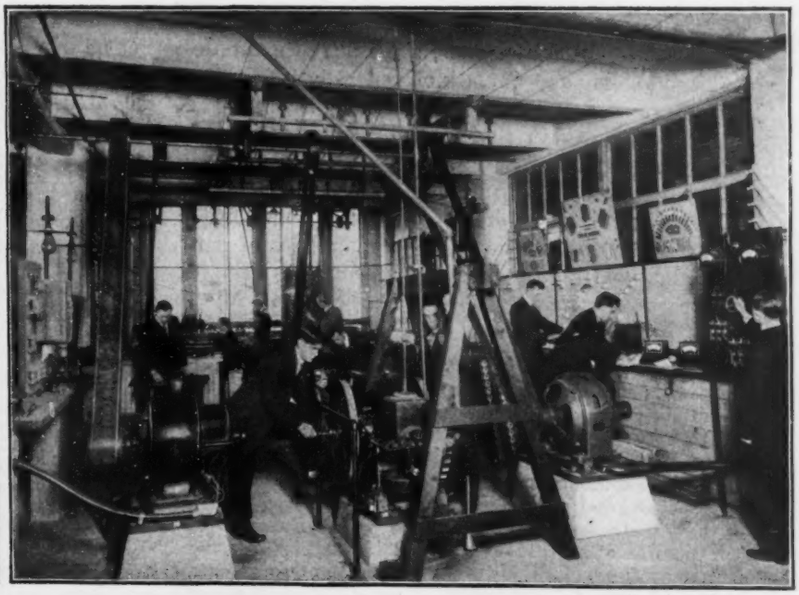
Department Coördination Essential

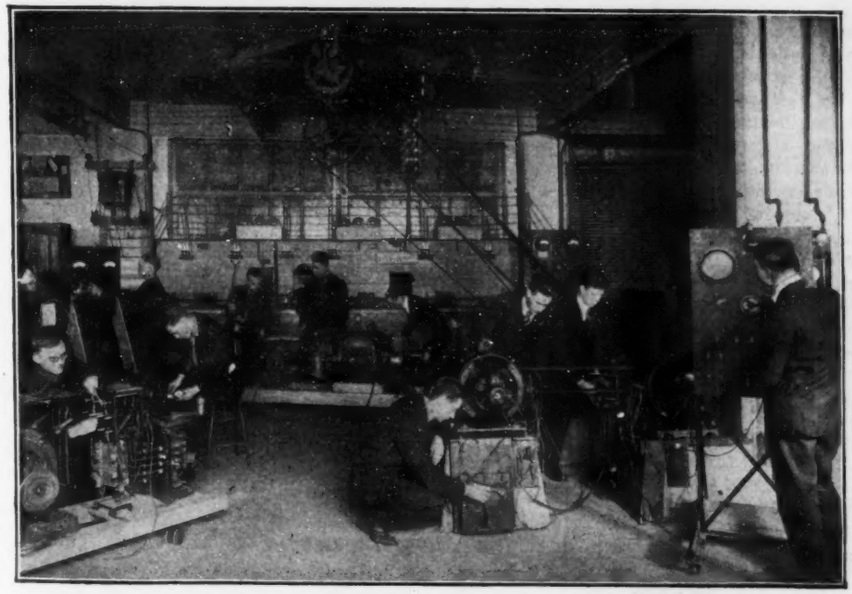
As coördination between departments is necessary with reference to the time schedule, so Dr. Mann finds it absolutely essential with respect to the content of courses. He lays emphasis on the need for more logical and coherent sequence of topics and a better adaptation of modern scientific theories. He urges the use of practical problems and commends in this connection Prof. R. H. Fernald's course on power plants at the University of Pennsylvania. Dr. Mann says:

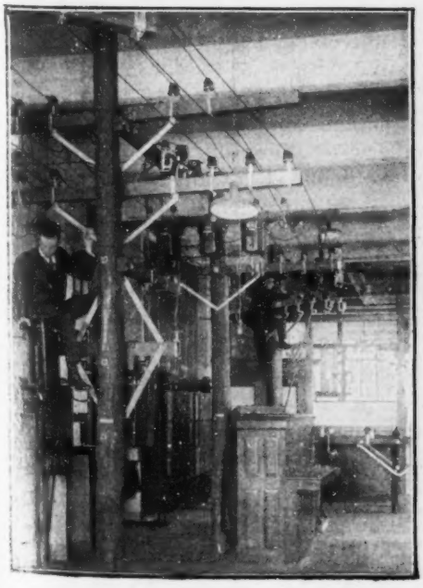
> While the topics of this course follow one another in a logical sequence, they are chosen largely from engineering practice and include much of the practical information every engineer must have when he goes to work. Many of the problems are actual cases that really occur in engineering, so that they appeal both to professional instinct and to the senses of values and costs—in fact, many of them are openly problems that deal with costs of operation and maintenance in working plants. Yet the course is not a mere mass of useful information; rather, useful information is the vehicle for conveying to the student a firm grasp of fundamental principles and engineering methods of attacking and analyzing problems, not only from the point of view of scientific theory, but also with due consideration to the limitations imposed by practice and by costs. . . .
>
> There has always been and still is a strong aversion on the part of colleges to placing emphasis on the material and financial aspect of the engineer's work. Yet it is a burning question whether the commercial bearings of each subject cannot be introduced into every course in such a way as to increase enormously its use and its vitality without in the least impairing its inherent scientific value. The enrichment of the content of courses by judicious appeal to practice and costs is a problem that offers rich opportunity for further experiment.

EXAMPLES OF INDUSTRIAL EDUCATION IN COLLEGES AND MANUFACTURING PLANTS









The two serious obstacles to coöperation in the content of courses, Dr. Mann finds, are reverence for department autonomy and the lack of generally intelligible and transferable details and methods of testing. The latter emphasizes again the need for a better system of testing and grading.

To this subject of testing and grading Dr. Mann gives much attention. For the purpose of making a beginning at removing some of the ambiguities of current examination practice, Professor Thorndike devised for seniors in electrical engineering a series of objective tests analogous to those used in his experiments with freshmen. Quoting Dr. Mann:

> Each test is intended to measure a specific ability, such as arithmetical computation, geometric construction, paragraph reading, understanding of words, mechanical dexterity or comprehension of diagrams. Each of these is a single activity, although requiring a complicated coördination of psychological processes. Then the tasks are so selected that their accomplishment can be indicated with little or no use of words, so that ability to perform the task is not confused with powers of verbal expression, and the errors of personal judgment in deciding whether an answer is right or wrong are reduced to a minimum. Because of this independence of the personal equation the results obtained by these tests at different schools, or at the same school at different times, are comparable with one another. . . . Cramming for any one set test may be avoided, since after the successful type has been found it is a relatively simple matter to construct ten or twenty alternate tests on the same pattern. Again, the successive tasks on each test are arranged in the order of difficulty, beginning with one that can be correctly met by almost all students of the degree of training in question and progressing gradually to one that can be done by only a few of the most gifted. Such a test is a scale up which the student climbs to the extent of his ability in the particular type of activity under scrutiny; so that, when the test is well constructed, his relative rank is determined without ambiguity by the difficulty of the task he can successfully master, rather than by an estimate of how much credit must be given for a partially completed task.

TESTS IN THE NATIONAL ARMY

Similar tests are being tried on a very extensive scale on the members of the new National Army by Majors Yerkes and Watson, psychologists, who have accepted commissions in the army for this purpose. Industries, too, are beginning to look to these tests to guide them in the selection and placing of workmen, in the hope of reducing the labor turnover that is costing the country several hundred million dollars a year. Although the movement is still in its infancy, enough has been done, Dr. Mann thinks, to forecast what may be accomplished by further scientific work in this field:

> In engineering it is conceivable that before long admission to college and achievement in college may be liberated from the bondage of personal equations as grading becomes less a matter of individual bias and more of valid records of actual accomplishment. Then college grades may be transferable among colleges; then academic marks may become significant to employers; then the results of educational experiments may be stated in convincing terms, and then students may come to respect their records and strive to beat them without artificial stimuli in the way of academic honors and credit bonuses.

Shopwork forms the last of Dr. Mann's problems of engineering education. "In American technical schools," he says, "shopwork still occupies a rather anomalous position. Few teachers of the mechanic arts have been granted the title 'professor,' and the work itself is seldom recognized as being of 'university grade.' Yet no one denies that it is an essential element in the equipment of every engineer, and therefore it has been tolerated by engineering faculties and allowed to develop as best it could. As a result there is no agreement as to the purposes and methods of shopwork. Nearly every school has a shop philosophy and a well-organized shop method of its own."

THE PURPOSE OF SHOPWORK

The purpose of shopwork Dr. Mann conceives to be to aid in bringing to the student a conception of what is meant by production and what are its fundamental problems. Numerous forms of shopwork, as conducted by the schools, are described by Dr. Mann, but he gives most attention to the coöperative plan in operation at the University of Cincinnati, inaugurated by Dean Herman Schneider.

The students at the University of Cincinnati are divided into two groups, one of which is assigned to work in industrial plants while the other goes to school. At the end of each biweekly period the two groups change places, so that the shops and the school are always fully manned. In the shops the students work as regular workmen for pay, but the nature of their work and the length of time each stays on any particular job are subject to approval by the university. The emphasis of the school work is on theory and principles, but these are related to the shopwork by "coördinators," who visit the students during each shop period and then meet the several groups during the university period in special coördination classes.

About 100 of the industries of Cincinnati and vicinity are now coöperating with the university. The companies represent every important phase of enginering, so that the university is able to arrange the work schedules in such a way that each student progresses regularly through every phase of his specialty, from the crude and rough work to the more difficult and responsible positions.

Financially, this coöperative plan is very economical both for the university and for the students. The university has access without expense to shops and shop equipment that are worth millions of dollars and are never allowed to deteriorate or become antiquated. The total cost to the university per student per year is about $130, compared with $250 to $600 at schools of equal grade. The money earned during shop periods makes possible an engineering education to many a boy who could not otherwise afford it.

In addition to the financial advantage, however, Dr. Mann points out many educational advantages. The work, he says, has three marked points of superiority over that done in college shops: (1) It is real commercial production that must succeed or fail on its merits; (2) the variety is much greater than is possible in any college shop, and (3) the student is thrown in personal touch with workmen, thus coming to know their point of view in a systematic way and securing a conception of the human problems of industry and the appraisement of human values and costs that cannot be acquired so well in any other way.

Another educational advantage pointed out is the use of "work observation sheets." Because it is obviously impossible for an industrial plant to permit its

workmen to spend time giving instructions to green college boys, each student when he begins a new job is given a work observation sheet containing from 50 to 200 questions concerning the details of the job and directing him to sources of information where he can find the answers. He is required to be able to answer and discuss these questions during the coördination periods. Shopwork thus becomes a series of exercises in defining and solving problems. Dr. Mann observes:

> With such rich opportunities for education lying plentifully about in every industrial plant, it is a striking anomaly that the schools make so little use of them. . . . The neglect of the possibilities of shopwork is responsible in large measure for the professional criticism that the graduates cannot apply theory to practice, for the establishment by large corporations of apprentice schools where their engineering graduates may complete their training on the practical side, for the preference shown by many firms for shop-trained rather than college-trained men, and for the insignificant percentage of production managers who are college graduates.

Some Proposed Solutions

The concluding part of the report is entitled "Suggested Solutions." As previously stated, Dr. Mann does not propose a standard curriculum, but rather a method by which engineering schools can work out courses to meet present-day engineering demands. As to the curriculum, the suggested solutions can be summarized as follows:

1. The number of required credit hours per week should be less than eighteen—preferably sixteen. This is not to decrease the hours of work done by the students, but to enable them to do all of their work more thoroughly. It necessarily involves extensive changes in the content of the courses.
2. Not more than five subjects should be studied at a given time.
3. Orientation, contact with real engineering projects and practical experiences are essential.
4. Interrelation between the concrete and the abstract is necessary throughout the entire course.

To reorganize its curriculum along these lines, the first step for any school is the appointment of a small standing committee composed of men interested in the problem of better teaching and able and willing to give considerable time to the work. The committee must first study the relations of the school with the adjacent industries, and, having selected the type of coöperative industrial work best fitted to the environment, it may proceed to formulate a curriculum for the school work itself.

If it is agreed that the chief function of school work is to give the greatest possible mastery of the essential principles of engineering science, then there is a common foundation on which all curricula must be built. The first step, therefore, in framing a course of study is to define this common basis of all engineering as clearly as possible: that is, to make a list of all the facts, principles and processes that are essential elements in the equipment of every engineer. This will constitute a "common core" made up of three distinct parts: (1) Science (mathematics, chemistry, physics and mechanics); (2) mechanic arts (drawing and shop), and (3) humanities (English and foreign languages).

The current organization of the "common core" recognizes no inherent or intrinsic relationship among these parts. The sciences are usually treated as sciences pure and simple, without regard to their function in engineering; in the mechanic arts the instruction shops are as a rule purposely separated from the construction shops, and the humanities generally strive consciously and vigorously to get away from engineering in order that the student may get at least a glimpse into the mysteries of language and of literature, and a touch of culture. Before a more effective "common core" can be constructed it is necessary to adopt a classification of the subject matter that obviously expresses the intrinsic relationship of the several component parts to the needs of every engineer.

A curriculum that satisfies all of the requirements mentioned would include at least four types of work as follows:

1. Actual participation in real industrial work, either during summer vacations or, better, through continuous coöperation with industries. This industrial experience must be supervised by the school and used as a source of problems and projects for scientific analysis in the classroom.
2. Engineering laboratory work, including drawing and descriptive geometry. Here the student would make the measurements and carry out the operations needed to enable him to solve the problems and projects that originate either in his industrial work or in his class work.
3. Mathematics and science, developed systematically in logical order, to furnish the backbone of the course.
4. Humanistic studies. The professional criticisms of the schools indicate that this field offers the greatest opportunity for effective changes in current practice, because lack of good English, of business sense and of understanding of men are most frequently mentioned by practicing engineers as points of weakness in the graduates of the schools.

The Humanistic Studies

The difficulty in present school practice evidently lies in the exclusion from the technical work of all consideration of the question of human values and costs; and, conversely, the isolation of the humanistic studies from all technical interest. But experiments show that technical work is more impelling and is, therefore, more fully mastered when it includes the consideration of values and costs, while humanistic work becomes significant, and therefore educative, when it starts from and builds upon the professional interest.

After the essential topics have been selected, as much time as is necessary for their mastery must be taken for this purpose. Two years may be enough, but if this is found to be inadequate, more time should be assigned. The important thing is that the essential elements be first selected, and then that time enough to master them be given, instead of the current practice of assigning the time and then coyering as much as possible within the set limit.

The first step toward successful specialization is intelligent sorting of the students so that each is led as definitely as possible into that type of work for which he is best fitted temperamentally. This requires that while the students are working through the "common core" every effort be made to discover the particular abilities and specific bent of each, not only by

means of ordinary examinations and academic grading, but also through objective tests of graded ability, personality estimates by members of the faculty, consideration of boyhood interests, and observations of each student's reactions to the different portions of the "common core." The work in the latter offers an excellent chance for vocational guidance.

To summarize, the plan of curriculum proposed differs from curricula as at present constructed in seven important ways:

1. The subject matter essential to the equipment of the engineer determines the time schedule, instead of arbitrary time limits determining the amount of this subject matter that can be given.

2. The proposed plan calls for the student's participation in real industrial work and the utilization of his experience there as a source of problems for the classroom.

3. Engineering laboratory work is proposed for the first two or three years instead of the last years.

4. Close coördination is required between the scientific courses of the "common core" and the practical work.

5. Emphasis is laid on the problems of values and costs.

6. For short independent courses in the technique of composition, literature, history, economics and so on are substituted humanistic studies extended into a consecutive course carried through the entire curriculum and consisting of live discussions and study of the best that has been thought and said concerning the immediate and the ultimate values in life.

7. Specialization is subordinated to vocational guidance. Because the "common core" gives a student a chance to choose his specialty on the basis of experience, and furnishes the faculty with a broader range of activities on which to base judgment of special aptitudes for particular work, the attention of the faculty is diverted "from the construction of specialized grooves down which the student may be shoved by routine administrative mechanisms to the study of the personalities, the temperaments and the capacities of young men eager to do the work for which they are best fitted."

As soon as it is possible to measure the results of teaching by impersonal means, successful teaching will be as easy to recognize as profitable research. Objective records of achievement have been found in industry to be one of the best incentives to creative work. Hence the line of progress in education does not lie in the direction of making arbitrary distinctions between research and teaching, but rather in the direction of removing the limitations placed upon the spirit of inquiry, so as to encourage its expansion to include education and human relations generally.

Reconstruction of a Two-Phase Station—II

How Some Engineering Problems Brought About by Rapid Growth of the System Were Tackled by an Iowa Company—Efficiency Instruments Employed in Boiler Room—Unusual Features of Electrical Construction

IN THE ELECTRICAL WORLD for Oct. 5, 1918, it was explained how the Iowa Railway & Light Company of Cedar Rapids provided for rapid growth in load so far as the coal-handling and stoking equipment was involved. Among the interesting things done were to provide for burning several grades of fuel available and to furnish steam for district heating in the most economical manner. Other mechanical features will be discussed in the present article, which will also give an account of how the electrical problems were handled.

Without rearranging the entire layout of the plant it was impossible to install the new boilers along the central firing aisle of the older section, owing to limitations imposed by railways on either side. Consequently in the new section the layout was duplicated, a central firing aisle with four boilers on a side. Seven of these boilers have been installed and the other is on order. When it has been placed in service there will be in the entire boiler room, measuring 80 ft. by 142 ft. (24 m. by 43 m.), four rows of four boilers each, with two firing aisles and duplicate coal and ash handling facilities with cross-over connections. The operating pressure is 200 lb. (14 kg. per sq.cm.) and the superheat 100 deg.

Each row of boilers is served by a concrete stack. In each case a straight smoke flue connects the four boilers with their respective stack, being suspended over the boilers from the beams of the ceiling. A 16-in. (41-cm.) thimble is provided between the flue and each boiler uptake. Per 1000 sq.ft. of steam-making surface there are on the chain-grate side of the plant 2.2 sq.ft. of smoke flue area, 2.1 sq.ft. of stack area and 20.1 sq.ft. of connected grate (2.2 sq.m., 2.1 sq.m. and 20.1 sq.m. per 1000 sq.m. of surface). On the underfeed stoker side the areas in the same order are 1.9, 1.6 and 15.1.

To the completed row of four boilers in the new addition forced draft is supplied by engine-driven fans having individual capacities of 21,000 cu.ft. (600 cu.m.) per minute. Each fan has the capacity to supply two boilers, leaving one in reserve. All three fans discharge into a single duct so equipped with dampers that any fan may be used on either pair of boilers. On the uncompleted row of boilers there are two fans, each having a capacity of 26,000 cu.ft. (about 750 cu.m.) per minute. It is the intention to install a third fan that will have capacity to care for the four boilers, leaving the other two in reserve. The fan engines are controlled by pressure governors.

It had been the practice to drive the stokers from the fan engines through a line shaft and chain connections, but with changing fuels, requiring different ratios of air, it was found desirable to separate the two services. Stoker engines are now being installed on the boiler-

room floor, with chain connections to line shafts in the basement and driving chains from shaft to stoker. One engine will serve two boilers.

On account of the two firing aisles and two delivery tracks, one perpendicular to the firing aisles and the other parallel, the coal and ash-handling equipment is rather complicated. Primarily the system consists of two continuous bucket conveyors, one serving each firing aisle, with two cross-over belt conveyors, so that coal may be transferred from one bucket conveyor to the other and desposited in the bunkers over either aisle regardless of the track on which it is delivered. At the end of each aisle there is a track hopper, with a shaking feeder underneath delivering into the continuous bucket conveyor which transfers the coal to overhead 200-ton steel bunkers, one for each pair of boilers, with a division at the center making two compartments. At the track end of each aisle is a large concrete ash hopper which is filled by the continuous bucket conveyor and

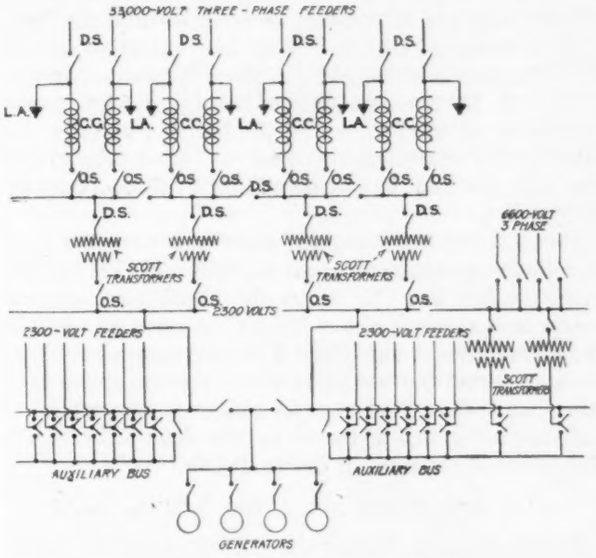


FIG. 8—SWITCHING ARRANGEMENTS IN A RECONSTRUCTED IOWA PLANT

delivers through a chute to the railway coal cars. On the other track at the side of the boiler room is a third hopper delivering by means of a pan conveyor to the nearest continuous carrier. There is also a large ash bunker exterior to the plant. Delivery of ash is effected by a belt conveyor receiving its load from one of the cross belts. All conveyors are motor-driven.

Depending upon the season, condensate from the generating units and the Quaker Oats plant forms a varying proportion of the boiler feed. With the latter make-up water from the river is returned to the boiler room through the same pipe and is delivered to an open feed-water heater or to a large supply tank at a higher level. The condenser circulating-water tunnel is a second source for make-up which is delivered to the supply tank. For boiler feeding there are one direct-acting and two turbine-driven centrifugal pumps having ratings of 450 gal. and 600 gal. (1700 l. and 2300 l.) per minute. The pumps are interchangeable and deliver to double feed lines, cross-connected so that either may be used to feed any particular boiler. The feed to the various boilers is controlled by hand-operated valves.

Throughout the boiler room numerous instruments are employed. For each row of four boilers there is an automatic recorder of CO_2 and draft at the uptake, with piping connections so that readings may be taken from any one boiler. Differential draft gages for each boiler show the draft over the fire and at the uptake and incidentally the drop through the setting. A U-tube attached to the gage gives the air pressure in the wind box of the stoker. A pyrometer with a twenty-four-point switch gives temperature readings at the top of the first pass and at the uptake from twelve boilers. There are a recording pressure gage on the steam header, recording and indicating pressure gages on the steam line to the Quaker Oats plant, and on the main feed line a flow meter to record all water supplied the boilers and a recording thermometer to give the temperature. The steam-heating main has indicating and recording pressure gages, and on the steam supply lines to the large turbine and the two bleeder units there are steam-flow meters.

In the generating room the three larger turbines have each a gage panel. Those for the bleeder turbines are duplicates containing gages giving the steam pressure at the throttle and in the first stage, a vacuum gage, a barometer and a speed indicator. The board serving the large turbine has an indicating and recording flow meter of the electrical type and an integrating wattmeter, with provisions to switch either instrument onto any one of the three machines just referred to. There are also a temperature indicator with a plug switch to give the temperature at four different points in the field, a mercury column for the vacuum, and a recording thermometer on the throttle and the exhaust.

FEATURES OF ELECTRICAL EQUIPMENT

The electrical part of the plant is unusual in that the generation is all two-phase, 2300-volt, and the distribution three-phase with the exception of numerous feeders for city service. Fig. 8, a single-line diagram, will give an indication of the general arrangement of the circuits. There are a main and an auxiliary bus. All 2300-volt feeder circuits are connected to the central studs of double-throw disconnecting oil switches serving as feeder switches and may be thrown onto either bus at will. The oil switches are solenoid-operated with remote control and on the feeder circuits are equipped with overload inverse-time-limit relays. The bus structure is mounted on 1¼-in. iron-pipe framework, each bus being set in an individual compartment made up of ⅜-in. "Transite" board.

Out-of-town service is three-phase at 33,000 volts. The current is stepped up by two sets of 600-kw., two-phase-three-phase T-connected transformers in multiple. Between the 2300-volt circuits and the transformers are oil switches with inverse-time-limit overload relays, and on the high-tension side between the transformers and the bus are disconnecting switches of the air-break type.

Each high-tension feeder circuit, of which there will soon be eight, has its oil switch and inverse-time-limit overload relays. The circuits are protected by aluminum-cell lightning arresters with the horn gaps mounted on the roof and the arrester tank inside the building. The circuits pass out through roof bushings to one tower line and three pole lines. On the latter wood-arm con-

struction is used within the city, but beyond the city limits bow-and-arrow and wishbone cross-arms are employed.

For the National Oats Company and other nearby customers 6600-volt service is drawn from the main bus through two banks of 1000-kva. T-connected transformers operating in parallel, with switches on each side of the transformers. Two-phase-three-phase differential reverse-current relays are used here. As shown in Fig. 9, there is a current transformer in each phase on the 2300-volt side of the transformer. The high-tension side has a current transformer on each leg of the three-phase circuit. With any reversal of

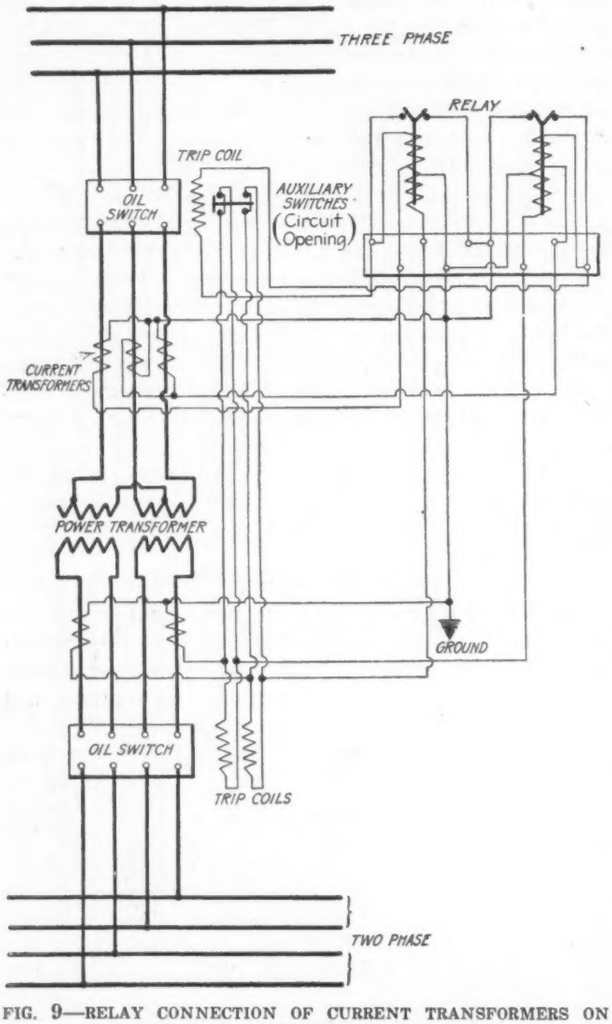


FIG. 9—RELAY CONNECTION OF CURRENT TRANSFORMERS ON EACH SIDE OF T-CONNECTED TRANSFORMER

current or defects within the transformer the relay becomes unbalanced and through the trip coils throws out the switches on each side of the T-connected transformer.

THE SYSTEM OPERATOR'S ROOM

An interesting feature of the electrical plant is the system operator's room, from which all high-tension lines are controlled. It contains a benchboard equipped with synchronizing apparatus, ammeters, voltmeters and reactive factor meters for each high-tension circuit, pull buttons for remote control of the oil switches, and red and green pilot lamps to indicate their position. On the opposite side of the room is a panelboard containing watt-hour meters, curve-drawing wattmeters, voltmeters and frequency meters, and induction-type relays and testing plugs for each circuit. At one end of the room is a telephone switchboard with connections to the city system and to a private line to the various stations operated by the company. This switchboard also affords communication with the boiler and turbine rooms. By wearing a head telephone receiver with an especially long cord the operator is able to reach the benchboard controlling the transmission lines, and he can look down into the turbine room through the glass front of his office. Above his desk is a map showing the transmission lines, the various generating stations and substations, the sectionalizing switches, etc. The operator is thus enabled to control the entire system in much the same way as that in which a train dispatcher runs his division.

All transformers in the station are grouped in a transformer room on the main floor. They are of the oil-insulated, water-cooled type. On the gallery above are all 6600-volt and 33,000-volt oil switches and the lightning arresters. Direct current for operating the oil switches may be supplied from three different sources—a 550-cell, 320-amp.-hr. storage battery, a 5-kw. motor-generator set used to charge the battery, and the exciter bus. Connections are made to each source so that the battery cannot by any possibility be thrown onto the exciter bus.

For 600-volt direct-current railway service there are two motor-generator sets, one rated at 1500 kw. and the other at 500 kw. To serve the small direct-current power load there is also a 100-kw. commercial set. On the direct-current switchboard arrangements have been made to throw the two railway motor-generator sets in series, so that current at 1200 volts may be supplied to outlying towns and at the same time 600-volt service to the company's system in Cedar Rapids.

SUPPLYING POWER FOR A BIG CEREAL PLANT

Electrical energy for the Quaker Oats plant is supplied through four two-phase, 2300-volt feeder circuits connected to the main bus through 1000-amp. oil switches with inverse-time-limit-relays. The service is carried through underground conduits by 850,000-circ.mil double-conductor, concentric cables, lead-covered and varnish-cambric insulated. At the Quaker Oats substation the circuits feed through oil switches to a 2300-volt bus, protection at this end being given by dynamometer-type reverse-power relays with tripping reactors. From the bus, transformation to three-phase, 240-volt current is effected through two banks of T-connected 3000-kva. transformers operating in parallel. From each bank of transformers low-tension buses pass to opposite ends of the customer's switchboard and then back of the board parallel with each other. Each bus contains four pieces of copper 10 in. (25 cm.) wide by ¼-in. (6.35 mm.) thick. In these buses are 22,500 lb. of copper. The substation is reported to be the largest low-voltage alternating-current installation in the country, and a similar claim is made for the two circuit breakers on the switchboard. They are rated at 240 volts, 12,000 amp., are hand-operated and provided with shunt trips and laminated studs.

J. M. Drabelle is electrical and mechanical engineer for the Iowa company.

Getting the Maximum Out of Equipment

The Power Producer and the User Must Co-operate in Order to Improve Power Factor, Otherwise Adequate Power to Meet Essential Needs May Not Be Available in the Approaching Winter—Remedy Readily Applicable

BY WILL BROWN
Electric Machinery Company

CENTRAL-STATION systems have met the power demands of war industries admirably since the war began, but a point has now been reached where most of the larger systems are already overloaded, and something has to be done immediately if further demands for power are to be fulfilled. This is particularly true at this time, because it is now difficult, if not almost impossible, to obtain new generating apparatus and distributing equipment, and also because the fall lighting load is beginning to overlap the power load, leaving no margin of capacity for growth of load. Furthermore, every one has been warned that fuel will be scarce this winter, so power production is further limited. That there has been a shortage of electric power for some time is a fact well known to the industry. The two-hundred-million-dollar emergency power bill is a belated effort by Congress to remedy the situation.

Since power is the basic necessity of all war industries, it behooves every one interested in its production and use to consider how it is going to be secured in adequate quantities this winter. Of course, the usual methods of economizing here and curtailing unnecessary waste there can still be followed; but something more must be done, and that is to consider how poor power factor is limiting power and how it can be improved. The reduction of power factor has become particularly serious since the war, probably because of the fact that much alternating-current equipment has been installed and not operated at the best loads.

HOW A WHOLE COMMUNITY MAY BE AFFECTED

As an example of how a community and its power company has been affected by the handicaps mentioned, the Public Service Electric Company of New Jersey is quoted as follows: "At one time last winter this great company was forced to shut off 50 per cent of power to consumers—due to fuel shortage."

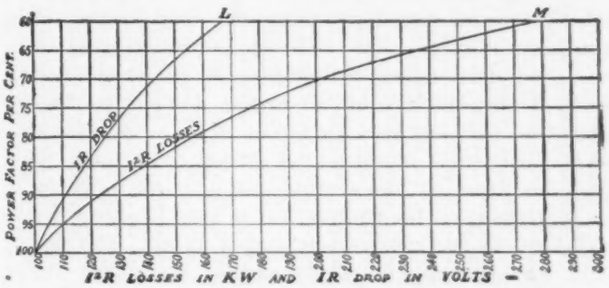
President McCarter of this company said: "In addition to coal difficulties, the company was materially handicapped by the failure to secure apparatus and supplies as contracted."

As to the handicap from low power factor, the company's general power representative writes as follows under date of August 30, 1918: "We now have a shortage of capacity both in generation and transmission, and in order to meet the demands of war industries, we are asking our customers to comply with our contract requirements of 80 per cent power factor. We have been making tests of our larger customers' operating conditions with an improvement in power factor in mind."

What is true of this company, which serves New Jersey's enormous war industries, is true of companies throughout Pennsylvania, Ohio, New York, Illinois, Indiana and other manufacturing states.

Power factor is a subject confronting not only the power producers but also the users, first, because if the user doesn't help to improve power factor he cannot get the power, and, second, because improving power factor is going to make it possible for him to get more work out of the equipment he has already installed. This is something that many industrial plant engineers have not stopped to consider, and still it is vital to maximum production. The details of the benefits to the producer and user will be discussed later, but what has been said should be sufficient to point out that coöperation between industrial plants and power producers is vitally essential now before any more time passes.

Plans cannot be definitely outlined for such coöperation since the conditions differ so in different localities, but it might be suggested that representatives of central-station companies (possibly the power sales engineers whose services as "contract getters" are not so essential now as they were before the big industrial boom) could confer with electrical representatives of the industries they serve to discuss plans of power-factor



HOW POWER FACTOR AFFECTS I^2R LOSS AND POTENTIAL DROP IN CONDUCTORS

improvement. Having more engineering information back of them, the central-station engineers might point out to the industrial-plant engineers how power factor is going to benefit the user and how they go to work to locate the causes of poor power factor and improve it. Consulting engineers might be invited into such conferences and left to give the advice necessary to correct conditions where the industrial plant is not well equipped with electrical engineering talent. At any rate, there is an opportunity for coöperation, and not much time or money will have to be expended in getting results, as the remedy can be applied at once. Time is the essence of the problem—there is no time to install additional apparatus even if it could be obtained.

It is a curious fact that many men view low power factor as an abstract evil that is causing the "other fellow" lots of trouble. They readily admit the importance of high power factor, but cannot seem to realize that they themselves are helping to make matters worse—that right in their own plant power is being wasted and money is being lost. Hundreds of central-station officials write that the greatest obstacle to power-factor improvement is indifference. At Niagara Falls indif-

ference on the part of a large user is responsible for a large lawsuit, involving more than a hundred thousand dollars—all for wattless current. Indifference is keeping many induction motors running at poor power factor when it would be just as easy to run them at good power factor.

It is not uncommon to find that managers in charge of power sales of large central stations are entirely unfamiliar with power-factor conditions on their own company's lines. For instance, in one case a manager, when asked whether his company was having trouble with power factor, replied that it was not and that it was being maintained well above 90 per cent with practically no corrective apparatus on the line. As a matter of fact the company was operating over 25,000 kva. of condensers on a system which was delivering an average of 45,000 kw. of power.

What would happen to a machinery salesman who made a practice of selling heavy machinery installed at a point in the country without figuring any cost for freight or delivery charges? And yet electric power companies have been allowing and are still allowing their salesmen to sell a commodity (electric power) without paying proper attention to one of the greatest sources of expense in power delivery, namely, lagging power factor of the consumer's load.

The power consumer who buys his power from a central station must also mend his ways. In the past large central stations which had excess power to sell were not over-particular about anything but load factor. The times are different now. Electric power is going to be sold and used under restrictions as to power factor. Central stations are by no means anxious to impose penalties, but they may be forced to do so if those who cause poor power factor do not correct conditions. This does not mean that the average cost of power is going to be increased; on the contrary, it is very likely that this will tend to decrease certain power rates. The power user who operates his plant so that his power factor is kept relatively high will actually be receiving a bonus in the way of reduced rates.

However, rates based on power factor are only a means to an end, and if the customers once realize how big an economy they can secure by a little attention to motor operation they will never again turn to old haphazard methods, and when added to this is the very present possibility that power in some cases cannot be secured at all unless power factor is improved, surely the power customers will get busy and improve their loads.

There is one thing encouraging about the situation; nine times out of ten when the discovery is made of what is really causing poor power factor it is possible to make considerable improvements without any additional apparatus. There is always a better way of using equipment now installed, and the advantage is that the remedy can be applied at once.

PICTURE OF WASTE FROM LOW POWER FACTOR

To visualize the losses brought about by low power factor, imagine a great hill of junked electrical apparatus—alternators, transformers, oil switches, thousands of miles of copper wire, lying tangled all over "no man's land." That's about what it means when we say in cold engineer's English that low power factor cuts down the capacity of generating, transmission and distributing apparatus. Alongside of this first hill is a second hill, small it is true, but very formidable. Here are piles of steam engines, gas engines, waterwheels and steam turbines that are giving no service at all. This is the condition that exists when we say that part of the capacity of prime movers is wasted because of low power factor. In addition to this there is another waste that cannot be shown as a piled-up hill of wreckage, but it exists nevertheless. It is the lowered efficiency at which all prime movers are forced to operate when they are working at part load.

Turn now to a water-power plant. Over the giant spillway thousands of tons of water is pouring, all wasted because the wheels can be operated only at part gate, this in turn being due to the reduced rating of the generators caused by poor power factor. The water can't be stored, the generators can't carry any more current, and so all this water power is going to waste just when it is needed most. Every kilowatt of I^2R loss means burning a certain amount of coal. The I^2R losses at 70 per cent power factor are more than twice as large as the I^2R losses at unity power factor (same power delivered in both cases). Then try to imagine the accidents and shut-downs happening every day due to overheating of conductors and consequent break-down of insulation. Low power factor is indirectly responsible for much of this contributory damage. Overloaded apparatus means work for the troubleman. It is difficult to think of a simile that will typify poor voltage regulation.

Every motor on such a system is working under the handicap of poor voltage regulation, and sometimes it doesn't work at all. Furthermore, poor power factor is usually an indication that alternating-current apparatus is working considerably below rating. This means that maximum use is not being obtained from equipment. The income of the power company is cut down just at the time when the customer is willing to pay almost any reasonable price in order to get increased power. The contributory damage which low power factor causes in this way cannot be computed. We know that it is serious because every productive hour counts in a munition plant or shipyard to-day as never before. Imagine the carloads of material—iron, copper, steel, etc.—and the skilled labor as well—which could be released for other war work if by some magic the power factor of the peak load on all electrical systems could be raised to 100 per cent!

Evil effects of low, lagging power factor are too well known to need much discussion. But it is one thing to understand statements in a general sort of a way and quite a different thing to be brought rudely up against the facts themselves.

TYPICAL EXAMPLES

Here are typical examples of things that are now happening, using the words of the central-station managers who reported the cases:

Case 1.—"Our transmission lines were designed for certain loads, at 80 per cent power factor. After the load was connected we found the power factor to be around 60 or 65 per cent, sometimes as low as 50 per cent. When the demand for power kept increasing and the power factor still remained low it was the cause of very poor regulation, which necessitated reinforcing of the line. Had we had

something in our contracts penalizing for low power factor, no doubt consumers would have kept it high and we would not have had to reinforce the line."

Case 2.—"We designed a line, 22 miles (35 km.) in length, 22,000 volts, for a certain kilowatt load, at 80 per cent power factor. After the load was connected, including a very large hoist, we found the power factor during the hoisting period would drop as low as 50 per cent. This doubled the kva. in the line and made regulation so poor that the hoist could not be operated. We had nothing in our contract protecting us on this installation, and as long as the consumer keeps his kilowatt demand in accordance with the contract we must serve it, which means we must practically double our line capacity in order to take care of the wattless currents."

Case 3.—"In calculating our generator capacity we did so on basis of 80 per cent power factor. We took on a lot of load recently, assuming it to be 80 per cent power factor, and made the necessary power station increase to take care of it. The power factor on the new load does not exceed 60 per cent, and our generator capacity is greatly reduced on account of the wattless currents."

Case 4.—"At our power house we have a day load (steam) of approximately 12,000 kw., which could be carried with good results on one turbine, but owing to low power factor on the system it is necessary to operate another turbine, which, of course, increases coal consumption materially." (R. B. McDonald, general manager of the People's Power Company, Moline, Ill.)

Case 5.—"At a certain power station we had three motors, totaling 400 hp., giving service to the towns, and one large power customer with a connected load of 300 hp. in induction motors. This customer's load factor is 80 per cent and the power factor is 60 per cent. At our request customer installed a synchronous condenser, receiving 10 per cent discount on his net bill. This resulted in raising the power factor to 85 per cent and enabled us to carry day load on two units, whereas it was previously necessary for us to run all three units to handle this load." (D. R. Truax, Central Illinois Public Service Company.)

Case 6.—Hodenpyl, Hardy & Company of New York state that on some of their large contracts, particularly in Ohio, they have allowed a better rate for energy consumed at specified high power factor. This has had the effect of inducing customers to install corrective apparatus, and in a number of cases where contracts approximated 10,000 kw. or more customers immediately installed synchronous condensers at their own expense.

The isolated plant which generates power for its own use is equally interested in providing for high power factor. This should be considered when apparatus is installed and also when planning methods of operating machines and motors. Of what use is it to install a pump of high efficiency if the leaks in the pipes are allowed to waste the water?

At Wappingers Falls, New York, there is a typical case of low power factor in an isolated plant. Waterwheel-driven alternators are supplying power for chemical works and a textile mill. Owing to partly loaded induction motors driving individual machines, the power factor frequently falls to 60 per cent lagging or even less. This makes conditions bad both as to voltage regulation and line losses. As a temporary expedient one of the waterwheel generators is allowed to run lightly loaded (approximately 25 per cent of its normal rating in kw.) and sufficiently overexcited to deliver its full rated kva. at a leading power factor. Under these conditions the over-all power factor at the generating plant is brought up to 90 per cent or better. Of course this does not relieve the losses in the feeders, but it does help materially in the operation of other alternators. The feeder lines are only a few hundred feet long; nevertheless the line losses are considerable as the voltage is low and the current large.

Any worth-while discussion of this subject of low power factor must cover a wide range of practical experience. For months past the writer has been obtaining information at first hand from central-station managers, power engineers and others, and the series of articles of which this one is the beginning is intended as an impartial résumé of that investigation. It will take up the matter of looking for causes of trouble, the testing of machines and motors; it will explain the main methods now employed for correcting power factor; it will describe the synchronous motor and its limitations and advantages; it will give the points of difference between such motors used for operation at unity power factor and for operation at low leading power factor—auto-synchronous motors, use of idle alternators as condensers, and static condensers; it will explain methods for determining condenser capacity required and how to estimate the kw. output and kva. input, etc., of synchronous motors for various duties. The proper location for condenser apparatus will also be discussed, and charts given showing the various proportion of I^2R losses saved by installing condensers at different points on the circuit.

In addition, the practice of central stations in regard to restrictions on loads of low power factor will be outlined. This will include a brief history of the situation from the central-station standpoint; the present emergency; regulatory measures now enforced by central stations, quoting prominent central-station managers; power contract clauses, etc.; also examples of power-factor penalties imposed on maximum-demand rate and on the energy rate for total kilowatt-hours consumed.

The subject of accurate power-factor metering, upon which the power-factor improvement depends, will be outlined, showing various methods which have been employed up to the present, including the voltmeter, ammeter, wattmeter method, reactive component meters, periodic tests with portable power-factor meters, graphic power-factor meters installed at customers' switchboards and the method employing two single-phase watt-hour meters for use on a balanced three-phase system. Advantages and disadvantages of the above will be given from actual experience, and conclusions as to what seems to be the most successful method of metering power factor for billing purposes will be presented.

BONUSES are an evil and must be stopped. I am acting upon that question. Concerning wages, the government is at present investigating the cost of living and wage conditions throughout the country. This will include, of course, conditions in the mining fields. I shall do all in my power to see that the commission investigating that subject is put in full possession of the facts concerning mine workers and be governed by its findings. But the proposal to consider an advance of mine wages by itself raises a wholly different question. Speaking in your behalf and at your request, I promised the President of the United States last October that no further increases in wages would be asked for during the period of the war. I cannot and will not break that promise. *—H. A. Garfield, United States Fuel Administrator, to the United Mine Workers.*

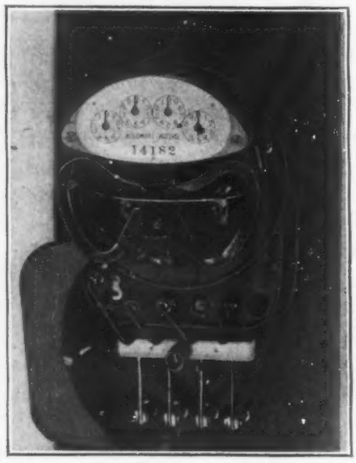
STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

SAVING TIME IN METER TESTING

Convenient Switch for This Purpose Is Employed by Bridgeport (Conn.) Company

In the meter department of the United Illuminating Company, Bridgeport, Conn., a convenient switch, illustrated herewith, is used to make rapid connections in testing. Formerly it was necessary to attach the test



TUBULAR CONTACTS ATTACHED TO SWITCH-BLADE EXTENSIONS MAKE CONTACT WITH METER TERMINALS

contacts by hand at a relatively slow rate, but in the present arrangement it is only necessary to throw the switch upward, bringing tubular contacts fastened to stiff copper leads into contact with the meter terminals.

AN EFFICIENT METHOD OF RECTIFYING LINE TROUBLE

Trouble Department Has Complete Control of All Difficulties Arising on Lines and in Consumers' Premises—Trouble Men Arrive Quickly

Where large war industries are dependent upon central-station service it is imperative that their lines should be in working condition all of the time. When anything goes wrong on the lines of the Cleveland (Ohio) Electric Illuminating Company, which has considerable war business, there is always an assurance that it will be speedily rectified. This assurance is due to the efficient trouble department, which receives the calls and dispatches patrolmen to the scene of trouble as soon as possible.

When a fault is reported it is recorded on the slip reproduced on this page. The name and address are noted, together with the name of person calling and visible details or results of the accident. The time received is stamped on the card by means of an electric clock, and the person who receives the call initials the report. From a map of Cleveland the operator notes the district and section of the call.

Patrolmen are instructed to call the office whenever they finish a job, and therefore it is not long before a man is available in this district who can be sent to the scene of the accident. He will be told where the trouble is and its nature. The card is stamped with the name of the man to whom the call is assigned and the time. After the work is completed the patrolman goes to the nearest telephone and reports "all clear." He gives the time the line was clear, stating the details of the trouble and whether the repairing is temporary or permanent. The card is again stamped with the time and is filed after being signed by the head of the trouble department. The patrolmen are also required to keep a report which corroborates the cards kept in the office. This report, which is also shown herewith, contains lines for noting money spent for car fare, telephoning, etc.

In the trouble department's office the work of the operator is facilitated by means of a large blackboard which denotes the feeders and cables of the system. The feeders are designated with letters and numbers and are represented by a square on the board. They can be tagged so that the operator will know their condition. Thus F6, B6 and A11 are marked as dead, grounded, etc. When lines are interconnected it can

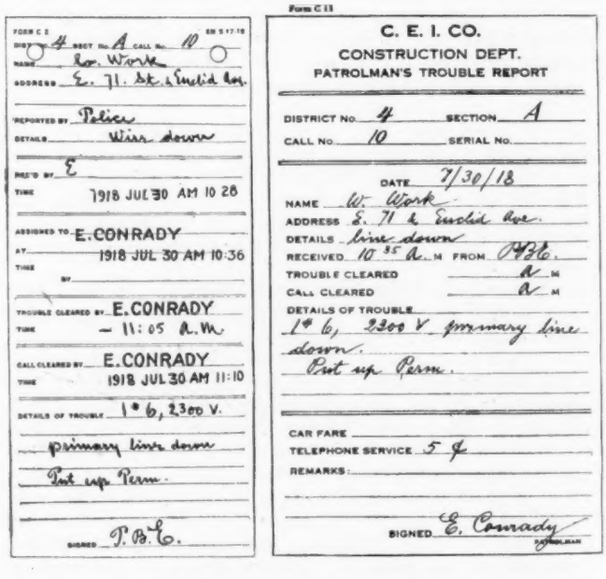


FIG. 1—TYPICAL CARD RECORD MADE IN RECTIFYING TROUBLE

be noted on the board by connecting the nails in the squares with strings.

In the event of a severe electric storm there may be a great number of trouble calls, and if these had to be taken care of by one operator the really necessary repair

work would be hampered by minor calls for replacing fuses, etc. To take care of this situation there are six booths in an adjoining room each equipped with a board and a desk telephone. Other employees of the company are called upon in case of an emergency to man these booths and record calls. Trouble requiring immediate

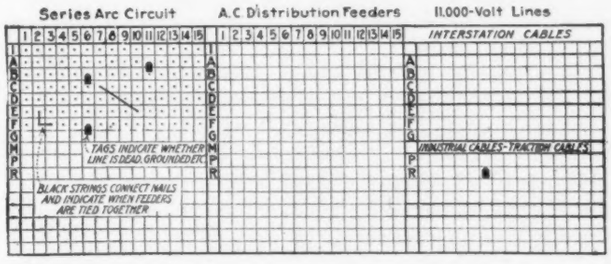

Series Arc Circuit
A.C. Distribution Feeders
11,000-Volt Lines
INTERSTATION CABLES
TAGS INDICATE WHETHER LINE IS DEAD, GROUNDED ETC.
INDUSTRIAL CABLES-TRACTION CABLES
BLACK STRINGS CONNECT NAILS AND INDICATE WHEN FEEDERS ARE TIED TOGETHER

FIG. 2—BOARD MARKED OFF IN THIS MANNER USED TO RECORD CONDITIONS ON CIRCUITS

rectification is recorded on red cards, whereas ordinary calls are marked on white, blue or yellow cards. In this way the urgent calls can be easily identified. The difference in color of the remainder of the calls is made to designate house calls, industrial plants, etc.

MECHANICAL INSTRUMENTS NEEDED IN A POWER HOUSE

It Is Becoming Established Central-Station Practice to Use More Instruments in the Boiler Room than Are Used in the Turbine Room

Following is a list of instruments and measuring equipment considered essential to the most economical operation of the steam end of a modern power station, as outlined recently before Ohio station operating men by C. E. Lewis of Toledo:

For Coal.—Track scales; choice of spiral spout meter, automatic scales at each point, weighing larry, weightometer. Coal calorimeter.

For Furnaces.—Draft gages at chimney, at outlet of economizers, at uptakes of boiler and over fire; choice of U-tube type, oil-filled differential type, indicating bellows type, recording types. Pressure gages on wind box (if forced draft), U-tube type, recording type. Recording flue-gas thermometer. Recording stoker speed meter.

For Boilers.—Steam-flow meter on each boiler; choice of Pitot-tube type, Venturi type, orifice type, combination recording steam flow, air flow, flue-gas temperature and indicating draft meter. Recording superheat thermometer. Recording blow-down meters.

For Economizers.—Four recording thermometers for gas entering, gas leaving, water entering and water leaving.

For Feed-Water Heaters.—Water meter on make-up line, on condensate line and on line leaving heater. Two recording thermometers for water entering heater. One recording thermometer for water leaving heater. Level recorder.

For Feed Pumps.—Indicating gage on suction and on discharge. Bi-record pressure gage.

For Turbines.—Indicating gages at throttle, at different stages, on bearing oil. Recording pressure gage. Superheat thermometer. Mercury vacuum gage. Barometer. Indicating thermometers. Hydrometer for air washer.

For Condensers.—Indicating or recording thermometers, or both, at exhaust steam from turbines, discharge water, injection water, air suction, condensate, condensate leaving reheater.

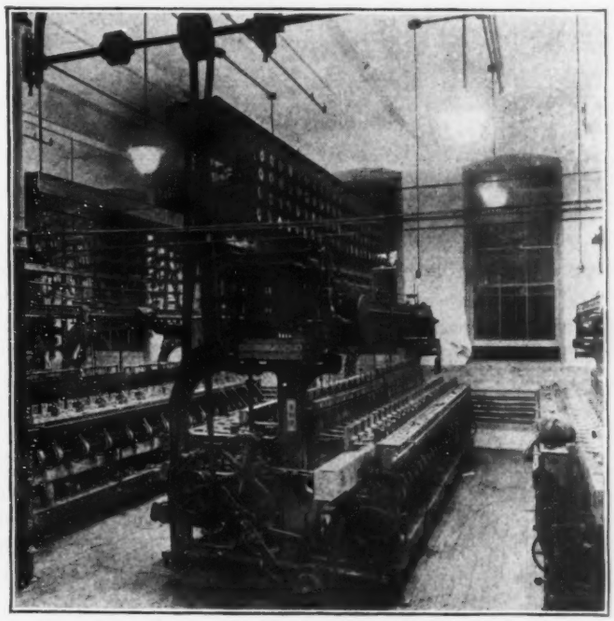
LIGHTING A LOOM ROOM FOR OVERTIME OPERATION

Semi-indirect Illumination Gave Sufficient Light Without Casting Shadows, While the Cost of Its Installation Was Less

BY F. C. TAYLOR

Being confronted with the now common problem of overtime operation, the Vogt Manufacturing Company recently had to rearrange its looms and improve the illumination. In one part of the factory a direct-lighting system had been tried out. This consisted of three 60-watt lamps with extensive reflectors hung about 4 ft. (1.2 m.) above the bar of the loom and equally spaced along it. The rear of the loom was illuminated by a 60-watt lamp. This direct system was found to cause shadows and did not give satisfaction.

In the new loom room the looms are illuminated by 200-watt type C lamps in Druid No. 3031 11-in. (28-cm.) semi-indirect glass fixtures. The ceiling and walls were covered with two coats of Rice's "mill white." To provide for portable lights a drop was hung over each loom within easy reach of the operator so that he could plug in an extension cord equipped with a trouble lamp.



SEMI-INDIRECT LIGHTING MAKES PORTABLE LAMPS UNNECESSARY

However, when the semi-indirect system was installed it was found that the intensity of light and the lack of shadows made a trouble lamp superfluous.

It is interesting to note that this semi-indirect system of illumination cost less to install than any other system and gave better results.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

HARRISBURG HAS ADOPTED CONTINUOUS METER READING

Besides Lessening Considerably the Work of Bookkeeping, It Opens the Way for Better Sales of Electrical Appliances

The Harrisburg (Pa.) Light & Power Company has just adopted the continuous meter-reading system which will apply to all electrical consumers and is already in operation. A large amount of work was curtailed in the change-over from the old ledger system, but from now on it will make the work of the cashier and bookkeepers much easier. Another very important result of the change will be that it will produce a far better distribution of the crowd in the company's sales office and bring opportunity for more careful selling methods.

Under the old system, discount day brought a large run on the electric light office and produced so great a crowd that it was practically impossible to bring any selling influence to bear. From now on, however, there will be a limited number of discount takers in the office every day, and it will be possible to discuss the matter of appliances with them. This, it is felt, is certain to produce a large amount of business which otherwise would not be developed.

ELECTRIC RANGE SALES IN NORTHWEST CURTAILED

Idea, However, Is Not Abandoned, and Several Ingenious Plans Have Been Developed to Keep Interest Alive

A questionnaire was sent out a few months ago by the electric range committee of the Northwest Electric Light and Power Association to those central stations in the Northwest that had been engaged in range service. At the recent convention of the association the committee presented its report based on this questionnaire.

The replies received showed that with a few exceptions all of the companies answering have curtailed, if not entirely stopped, range sales work. Among the reasons given were shortage of power, increased cost of line construction and increased cost and difficulty of securing ranges, but the underlying reason in each reply was the necessity of curtailing expenses in general to meet war conditions. Other contributing causes were given as the cost and scarcity of transformers, the difficulty of retaining competent range salesmen at reasonable salaries, the high cost of ranges, the necessity of financing from earnings all ordinary additions to properties, and the feeling that money spent for new business should be devoted to securing the load which would give the greatest return on the money invested.

The replies indicated that, although little effort is being made to push range sales actively, none of the companies that reported has entirely ceased selling ranges. All have stopped making expensive line extensions, and in some instances no line construction other than the hanging of transformers and running of service blocks is done.

The committee stated that it felt that too much time, effort and money had been expended in promotion and sales work to warrant the entire abandonment of range sales. Several companies, it was pointed out, which have practically ceased all effort toward range sales have realized the necessity of maintaining interest in electric cooking, and a number of ingenious plans have been followed to keep this interest alive until conditions again warrant active range campaigns.

One of the companies reported that owing to war conditions the electric cooking idea had taken on the aspect of a general educational campaign intended to prepare the people in the city persistently for an electric range campaign which will be arranged when conditions become normal again. This company inaugurated a recipe service to 2000 prospective customers. This recipe service is not carried on to sell ranges now; it is just preparing for the future, on the theory that the inherent value of advertising is cumulative and must go on persistently. After twenty recipes had been mailed return post cards were sent asking if those to whom they were sent wished the recipe service continued, and 500 requests for continuance were received. These 500 have developed from possibilities into real "prospects." Each recipe sent out carried a few remarks on how electric cooking will improve the particular dish. No range salesmen are employed. Many prospective customers have been sufficiently interested to call at the cooking bureau, and ranges are sold where no extensions of lines are necessary. Where extensions of lines are necessary the inquirer is told that war conditions prevent expenditures of this character, but the interest in electric cooking is not allowed to wane.

FIXTURES FORMERLY RENTED ARE NOW SOLD OUTRIGHT

Conditions Have Increased Maintenance Cost Until There Is No Longer Any Rental Profit

A few years ago the commercial department of the New Orleans (La.) Railway & Light Company instituted a practice of installing high candlepower "mazda" fixtures on a rental basis, the object being to discontinue arc-lamp service. In all about 1500 of these lighting fixtures, or "pendants," as they were called, were put out, and up to within a few months ago the monthly rental produced a very satisfactory revenue over the

operating expense. The influence of the war, however, has upset these conditions and increased the cost of maintenance until it practically balances the revenue. It has been decided therefore to discontinue the rental of "mazda" fixtures, but to continue the furnishing of them on a straight sale basis.

Present customers will be called upon to purchase the fixtures now in use on a rental basis, and this turnover will bring in a considerable amount of money and a large margin of profit. Some of the fixtures have been in service for several years, though they are now in perfect condition, and the price on the present basis of cost is well in advance of the original cost of the fixtures. It is believed that there will be very little difficulty in taking care of this change-over, for the fixtures are giving entire satisfaction, and it will be far more expensive for the customer to give them up and purchase something else.

STEP METER RATE BEING DISCOURAGED IN NEW YORK

Block System Providing the Same Revenue Is Found to Be More Equitable and Not to Embody Inconsistencies

A movement is on foot in New York State to abolish step meter rates. At the June meeting of the executive committee of the Empire State Gas and Electric Association the following resolution was adopted:

"Resolved, that it is the consensus of opinion of the executive committee that the method of charge for gas and electric service known as the step meter rate should be discontinued by companies wherever possible."

As part of its activity in this direction there is shown in a recent issue of the company's *Bulletin* a

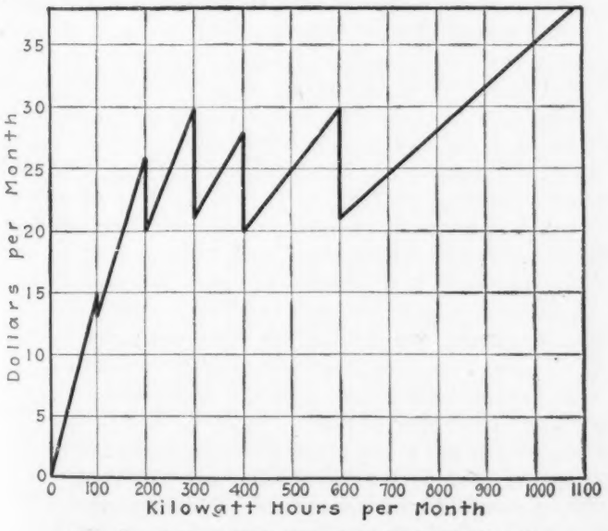


FIG. 1—HOW A STEP METER RATE WORKED OUT

graphic representation of a step meter rate actually in use by one of the companies in the state. The Public Service Commission of the state ordinarily requires that rates of this character be governed by a so-called "more or less" clause, which provides that a discount or reduction in rates shall not be applied in such a manner that an increase in consumption will result in a reduction in the net bills. This particular rate, however, had never been filed with the commission, and no such clause was in effect.

A study of the curve will show that the net bill will be $25 per month whenever a consumer uses 191, 250,

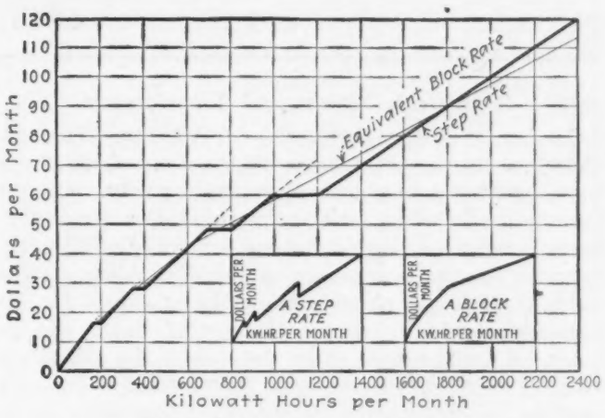


FIG. 2—COMPARISON OF BLOCK AND STEP RATES

357, 500 or 713 kw.-hr. For a consumption of 200 kw.-hr., however, the bill would go up to $26; for 300 kw.-hr. or 600 kw.-hr. to $30, and back to $28 for a consumption of 400 kw.-hr. Even if the "more or less" clause had been in effect, the result would have been nearly as bad, for the bill would have remained at $20 for all consumption from 153 kw.-hr. to 401 kw.-hr. It is admitted, of course, that this particular rate is an extreme case, but the same general situation results to a greater or less extent in the operation of all step rates.

A comparison of a step rate and a block rate computed to return the same revenue was developed as shown. The heavy line represents a step rate with a "more or less" clause in effect, and the light line running through it shows a block rate that can be substituted for it. The step rate is as follows: On a total consumption of from 100 kw.-hr. to 200 kw.-hr. per month, 10 cents per kilowatt-hour; from 201 kw.-hr. to 400 kw.-hr. per month, 8 cents per kilowatt-hour; from 401 kw.-hr. to 800 kw.-hr. per month, 7 cents per kilowatt-hour; from 801 kw.-hr. to 1200 kw.-hr. per month, 6 cents per kilowatt-hour; more than 1200 kw.-hr. per month, 5 cents per kilowatt-hour.

The same revenue will result from the following block rate: For the first 100 kw.-hr. per month, 10 cents per kilowatt-hour; for the next 100 kw.-hr. per month, 8 cents per kilowatt-hour; for the next 400 kw.-hr. per month, 6 cents per kilowatt-hour; for all over 600 kw.-hr. per month, 4 cents per kilowatt-hour.

In computing the substitute block rate, a curve is sketched which cuts off the sharp points and angles of the step rate. From this curve it would seem that for the first 100 kw.-hr. no change is necessary in a block of 100 kw.-hr., so that 10 cents was decided upon. It would next seem that the curve gave a cost for 200 kw.-hr. of $18. The first block of 100 kw.-hr., however, would cost $10, leaving $8 for 100 kw.-hr., or 8 cents per kilowatt-hour, and so on, for the remaining blocks. The computation, therefore, for the full rate schedule is not a difficult task and may quickly be accomplished by a company wishing to make the change.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Design of Large Dynamos.—M. VIDMAR.—This article investigates the changes in the dimensions of dynamos required to obtain increased capacity. On the assumption that in a series of machines the electromagnetic loading remains unchanged a number of laws are deduced for the dependence of the dimensions on the output. It is not possible to design machines for increased outputs by simple changes of linear dimensions, as would appear to be the case if the output coefficient were really a constant. As a matter of fact this coefficient decreases with increase of output if the speed remains the same. If designed according to the methods outlined, the losses will increase with the three-quarters power of the output, the ohmic drop will decrease with the fourth root of the output, and the percentage magnetizing current will decrease with the fourth root of the power. It is interesting to note that the heat-radiating capacity improves with increase in the size of the machine, as the parts in which the heat is generated are concentrated around the air gap where it can be carried off by the vigorous air draft, which improves as the machines become larger. It appears that the design of very large units will be determined mainly by heating considerations.—*Science Abstracts, Section B*, Aug. 31, 1918. (Abstracted from *Elektrot. u. Maschin.*, 36, March 31, 1918.)

Regulation of Alternating-Current Commutator Machines by Direct Current.—M. OSNOS.—Under the term "regulation" the author understands control of the speed of motors and of the voltage and frequency of generators and any other methods of regulation designed for adjusting the commutation and power factor of commutator machines. The methods described are all based on the regulation of the permeability of the machines themselves, or of apparatus external to the machines, by superposing direct current on the alternating currents flowing. The principle of the methods may be understood from one of the cases referred to, consisting of a four-pole commutator machine in which the windings of the four poles are connected to form the four arms of a bridge fed across one diagonal by alternating current passing through the armature, and across the other diagonal by direct current through a regulating resistance. The connections are such that the alternating current produces a four-pole field while the direct current produces a two-pole field that has no inducing effect on the four-pole armature. The superposed direct-current field alters the saturation of the machine so that the alternating-current field is weakened. If the machine has a number of poles not divisible by four, some of the field windings may be connected as described above and the remaining ones inserted outside the bridge. In the case of polyphase machines various devices are shown by which the direct-current field may be superposed on the alternating-current field in a non-inducing manner. The method must be modified for application to shunt machines, as variation of the permeability would not alter the flux but would merely change the value of the magnetizing current. In such cases reactive coils may be connected in series with the field windings, these coils being regulated by direct current. After describing a number of methods for connecting such reactive coils into circuit, details are given of their design.—*Science Abstracts, Section B*, Aug. 31, 1918. (*Elekt. Zeits.*, May 23, May 30 and June 6, 1918.)

Lamps and Lighting

Atomic Heats of Tungsten and of Carbon at Incandescent Temperatures.—A. G. WORTHING.—The atomic heat of tungsten under constant pressure has been measured by two methods for the region 1200 deg. K. to 2500 deg. K. The atomic heat of carbon has been measured by one method for the region 1200 deg. K. to 2100 deg. K. The results on tungsten when corrected to give atomic heats under constant volume lead to values considerably greater than those ordinarily expected in accordance with many theories. The carbon values agree well with this expected limit. Indications of an apparent lag between resistance and temperature or some other functions have been found which the writer is unable to explain. —*Physical Review*, September, 1918.

Generation, Transmission and Distribution

Power Development in Foreign Countries.—In Great Britain proposals have been set forth for vast central-station fuel power plants at strategic points for the supply of power for all industries, so as to secure the most efficient use of coal. The extraction of all by-products is being urged not merely on account of their value, which is enormous, but also because a cheap fuel will thereby become available to reduce the cost of power. A board of scientific societies acting under the auspices of the imperial government and recruited from the highest ranks of technical men in Great Britain is studying the resources of the empire. France, until the war an importer of one-third of its coal, was faced by the loss to the enemy of a considerable proportion of its own mines and the rising price and difficulties of transportation for imported fuel. Promptly, and in spite of many difficulties, it has proceeded with hydroelectric developments and by the end of this year will have 1,000,000 hp. developed, an increase of 450,000 hp. since 1910, two-thirds of which has been secured since war broke out. Lacking in coal, Italy is an excellent field for water-power development, and through the Allgemeine Elektricitäts Gesellschaft the Germans secured a hold on Italian industry such that by 1910 515,000 hp. was developed. Since the outbreak of war the Italian government has not merely broken the Teutonic hold but has proceeded with an active water-power policy. The

power situation in neutral European countries is also outlined in this article.—*Monetary Times of Canada*, (Toronto), Sept. 20, 1918.

Mechanical Design and Specification of the Turbo-Alternator Rotor.—S. F. BARCLAY.—In this article the conditions underlying the mechanical design of the high-speed alternator rotor are reviewed and suggestions are made concerning the specifications for the guidance of the purchaser's technical adviser. The subject is dealt with by means of curves and diagrams and is not mathematical.—*Journal of (British) Institution of Electrical Engineers*, July, 1918.

Coal Economy in Mine Boiler Firing.—The question of scientific control of flue gases receives scant attention in the majority of plants. The comparatively few large mining installations have complete organizations for control and research and engineers who attend to such details; the small mining proposition cannot give the matter the attention it would deserve if operations were being conducted on a large scale; but among the number of medium-sized plants there are many installations where economical firing is little understood and scientific control believed to be an outside consideration. In this paper are given the underlying principles of fuel combustion and the description of a carbon-dioxide recorder apparatus. It should lead to a better realization of the feasibility of closer fuel control.—*Engineering and Mining Journal*, Sept. 21, 1918.

Saving Coal in Boiler Plants.—HENRY KREISINGER.—This paper is written for the fireman, the engineer and the owner of the small or medium-size plant, which as a rule is hand-fired. The principal losses that occur and their remedies are outlined. Stack losses and losses from incomplete combustion are particularly discussed. The significance of flue-gas analysis is pointed out and the importance of flue-gas temperatures shown.—*Technical Paper No. 205*, Bureau of Mines.

Traction

The Nuremberg-Furth Electric Railway.—P. SCHOLTES.—A previous article by the author dealt with the design and equipment of this line (*Abs.* 1140, 1905). The present article deals with the results which have followed from the adoption of the third-rail system at a later stage owing to electrolytic troubles and disturbance of telephone circuits. Diagrams and records are given which show that at the present moment these difficulties have disappeared. The author considers that it is desirable to return the current to the station mainly by insulated conductors and that the rails should only be regarded as equalizing circuits. In this way the heaping-up of the current in uninsulated rails is avoided.—*Science Abstracts, Section B*, Aug. 31, 1918. (Abstracted from *Elekt, Zeits., 39*, April 25, 1918.)

Installations, Systems and Appliances

New Plant of Pennsylvania Salt Manufacturing Company.—The company has a modern alternating-current plant with rotary conversion to direct current for electrolytic work. In the boiler room there is an operating board carrying a most complete complement of instruments and control for boiler-room auxiliaries and dampers. A modern system of cooling for the electrical machinery is used in the turbine room. By means of a series of eductor-type jet condensers the auxiliaries are operated under varying vacuum to maintain the heat balance.—*Power*, Sept. 17, 1918.

Selection of Bridge Motors for Traveling Cranes.—One of the papers which attracted considerable favorable comment at the recent Baltimore convention of the Association of Iron and Steel Electrical Engineers was entitled "Bridge Motors for Overhead Traveling Cranes," by R. H. McLain of the General Electric Company. Data were collected on the characteristics of twelve typical cranes, giving loads, rolling friction, speed and acceleration required for the particular service. Then, by the use of curves, the proper motor could be selected. The paper called forth an animated discussion in which many doubted the usefulness of such calculations as were introduced by Mr. McLain on the ground that the variation in friction is too great under operating conditions. Others felt that the method proposed in the paper was a step in the right direction and that more data of the kind presented should be gathered to make it possible to draw conclusions regarding operating conditions to be expected in various classes of work. Many had a good word to say for automatic control. It was also suggested that dynamic braking might be feasible for crane motors, particularly in the shipyards, where the travel is considerable and the wind may make accurate stopping difficult. In conclusion, Mr. McLain said that data of the kind he had presented would make possible the analysis of crane troubles, so that if the friction became excessive because of faulty alignment of the crane this could be remedied instead of putting in a larger motor as is commonly done.

Gas Firing for Boilers.—A comparison between gas and coal firing for steam raising deals particularly with efficiencies possible by improved gas-firing methods.—London *Electrical Times*, Aug. 1, 1918.

Electrophysics and Magnetism

Effects of Dielectrics on the Sparking Voltage.—E. R. WOLCOTT.—The results of this investigation might be summarized as follows: (1) The sparking voltage between a point and plate when the point is positive is about half of that when the point is negative; (2) a dielectric of discontinuous surface placed over the plate lowers the sparking voltage when the point is negative to a value comparable to that when the point is positive; (3) the discontinuity of surface may be an edge or hole, or the body may be fibrous or porous; (4) no lowering of the sparking voltage results when means are provided for conducting away the charge, as when the deposit is sufficiently moist or is in a humid atmosphere; (5) no lowering of the sparking voltage results when means are provided for preventing the accumulation of a heavy charge as by covering the dielectric with a grounded screen; (6) an intense brush glow appears upon the dielectric when just under sparking voltage. The decrease in resistance of the gaseous medium between the electrodes thus produced is probably the cause of the lowering of the sparking voltage.—*Physical Review*, October, 1918.

On the Effect of a Transverse Magnetic Field on the Discharge Through a Geissler Tube.—JAMES E. IVES.—The quantitative effects on the current in the Geissler tube of a transverse magnetic field are studied in this investigation. Many curves between current and mag-

netic field are presented showing these relations.—*Physical Review*, October, 1918.

Some Peculiar Thermoelectric Effects.—PAUL D. FOOTE and T. R. HARRISON.—It is pointed out that thermoelectric emfs. may be developed by touching a hot wire to a cold wire of the same material, by crossing two wires and heating one of the wires near the junction, and by drawing rapidly a hot wire over a cold wire, by joining two wires of different diameters and heating either wire near the junction. Effects of this character are discussed in this paper.—*Journal of Washington Academy of Sciences*, Oct. 4, 1918.

Magnetic Properties of Zinc Blende and Some Other Minerals.—F. STUTZER, W. GROSS and K. BORNEMANN.—Researches started in 1914 for the purpose of investigating the possibility of magnetic separation and the state of combination of the iron in minerals. Two equal primary coils were so mounted at right angles to one another that there was no mutual induction. The primaries, on glass tubes, 30 mm. in diameter, were joined in series, the secondaries (wound over them) in opposition. On suddenly changing the primary current, the ballistic galvanometer in the secondary circuit gave no deflection. When a piece of iron wire or a magnetic mineral in the shape of powder contained in a thin-walled glass bottle was introduced into the one tube, a deflection was observed. This deflection was, however, very weak with zinc blende. The differential arrangement was therefore improved by inserting an interrupter (at 1200 r.p.m.) into the primary and by rectifying the resulting secondary alternating current with the aid of a commutator. The deflections were then proportional to the susceptibility.—*Science Abstracts, Section B*, Aug. 31, 1918. (*Metall. u. Erz.*, 15, 1, Jan. 8, 1918.)

Electrochemistry and Batteries

The Sign of Potentials.—OLIVER P. WATTS.—A historical retrospect is given concerning the usage of electrochemists in designating the signs of potentials, and a plea is made for continuing the present conventions. It is pointed out that if the present conceptions of electric current being a flow of (so-called) negative electrons be correct, negative electrons would flow only to material of relatively higher (more positive) potential and the present usage of designating potentials would fit the facts in this case, while the proposed inversion of signs would contradict the facts.—*Paper presented before Convention American Electrochemical Society*, Sept. 30, 1918.

Units, Measurements and Instruments

Theory of the Thermionic Amplifier.—H. J. VAN DER BIJL.—In this paper the theory of operation of the thermionic amplifier is dealt with. This device consists essentially of an evacuated vessel containing a hot cathode and a third electrode adjacent to the cathode. This auxiliary electrode may be in the form of a grid placed between the cathode and anode. It may also be in the form of a plate placed on the side of the cathode opposite to that of the anode, or in the form of a wire or a plurality of wires galvanically connected and placed in the plane of the cathode parallel to that of the anode. The theory given here applies to any of these structures, although in particular it will be explained with reference to the case in which the auxiliary electrode takes the form of a grid between cathode and anode. Equations and experimental verifications are given.—*Physical Review*, September, 1918.

Miscellaneous

How Much to Charge the Consumer.—C. E. GRUNSKY.—The apportioning of the burden among the consumers is a problem which occasions quite as much discussion as the determination of what interest the company is to receive on its investment. Favoring the large consumer, ready-to-serve charges and other fundamental considerations are here discussed from the standpoint of their logical justification as well as their present feasibility.—*Journal of Electricity*, Sept. 1, 1918.

National Engineering Societies and the National Research Council.—GEORGE ELLERY HALE.—This article is a continuation of one by the author on May 28 in which he briefly described the war activities of the National Research Council. In the present paper the writer takes up more particularly the engineering activities connected with the war, giving the objects of the various agencies and committees through which the government is working, together with their personnel.—*Proceedings A. I. E. E.*, October, 1918.

Metallography of Tungsten.—ZAY JEFFRIES.—In this paper the metallography of wrought and ductile tungsten in the various stages of manufacture is considered more or less in detail. The general relationship between the properties of tungsten and other metals is also considered, and it is explained why fibrous tungsten is ductile at room temperature, even though past experience with other metals would indicate that it should be brittle. Finally, there is a brief comment regarding some new fundamental metallographic propositions relating to all metals.—London *Engineering*, Aug. 30, 1918.

Metallography and Heat Treatment of Metals Used in Aëroplane Construction.—F. GROTTS.—The fourth of a series of articles dealing with this subject. In this installment the uses of copper and its alloys in aëroplane construction are given particular attention. Among the topics discussed are requirements for sheets and tubes, details of the brazing process, methods of heating, fluxes and preparation of parts.—*Chemical and Metallurgical Engineering*, Sept. 15, 1918.

By-product Installations for Power Stations.—KLINGENBERG.—The author reviews first the trend of the market for by-products. A great increase in production will cause a fall in prices and, in particular, the price of ammonium sulphate is likely to decrease owing to competition from the numerous nitrogen plants erected during the war, including those working the Haber process. After a brief review of distillation processes (coking and gas-making), the author deals with the erection and operation of plants for gasifying the whole of the fuel and recovering by-products. He investigates in detail the relative economy of three types of power-station plant, namely, steam turbines with coal-fired boilers, steam turbines with gas-fired boilers and by-product plant and gas engines with by-product plant. These three cases are investigated with certain specified prices of coal and capital costs for plants.—*Science Abstracts, Section B*, Aug. 31, 1918. (Abstracted from *Zeits. Vereines Deutsch. Ing.*, 62, Jan. 5, 1918.)

Use of Waste Solutions for Orsat Apparatus

To the Editor of ELECTRICAL WORLD:

Sir: Referring to an article in the July 13 issue of the ELECTRICAL WORLD on "Waste Solutions Utilized for Orsat Apparatus," I would venture to say that the 21 per cent KOH solution from Edison batteries might give rise to considerable error after this solution has become weakened and is saturated with particles of iron and nickel. The standard Edison solution also contains some lithium hydrate which would lead to error.

The use of this material is unwarranted except for the roughest of rough flue-gas analysis. I would like to hear something regarding a check-up of the error which would be introduced by this substitution.

H. E. WEIGHTMAN.

Engineering Service Company, Chicago, Ill.

Wood Fuel in Argentine Central Stations

To the Editor of ELECTRICAL WORLD:

Sir: Your article on the plant of the Central Argentine Railway in the issue of Oct. 12, 1918, was very interesting.

The writer recently returned from a trip to South America and saw this installation, which would be a credit to any country. He also collected considerable information on the burning of wood which may be of interest to your readers.

At one plant in Paraguay red Quebracho is used and costs $2.79 (United States currency) per ton delivered at the boilers. This wood is heavier than water and requires only 2.5 lb. to be equivalent to a pound of coal, while the woods we are used to in this country require 4 lb.

The following table was made up for the plant in question (prices are in United States currency):

	Wood	Coal	Oil
Equivalent weight, ratio	1	2.5 to 4	3.75 to 6
Equivalent value, ton	$2.93	$7.32 to $11.72	$11 to $17.58
Cost at that time, ton	2.93	23	31 to 50
Pre-war value	....	8	7.50

The government of Argentina has opened large oil fields in Rivadavia and since the war has largely increased the output. The government is charging the same price as is charged for imported oil, except to persons who contracted for their supply at the time when the oil fields were being opened for utilization.

One plant in Buenos Aires the writer visited was burning oil and wood. This was a plant of 5000 kw., and it was burning 30 tons of wood per day and all the oil it could get. It had burned as much as 200 tons of wood per day. The engineer had done considerable experimenting with different grades of wood, and the experiments which he conducted showed the result given in the following comparative tabulation:

Ratio, Wood to Coal	Kind of Wood
2.25 to 1	Red Quebracho without bark
2.25 to 1	Red Quebracho with bark
3.7-4.2 to 1	Mixed woods
2.7-3 to 1	White Quebracho

The plant was using a special firebox construction and had to watch superheaters as the long flames from the wood fires were liable to cause burning.

Another plant of 80,000 kw. was burning 1000 tons of wood and 500 tons of coal daily. It had extended the grates across the whole of the boilers, cut fire doors in the rear of the boiler and was throwing in wood from both ends. It was obtaining a ratio of 2.8 lb. of wood per pound of coal.

The coal used in all cases was either Cardiff coal from Wales or our best Pocahontas from the West Virginia coal mines.

Allentown, Pa. J. B. CRANE.

Scientific Development in Italy Not Followed Abroad

To the Editor of ELECTRICAL WORLD:

Sir: The difficulty to-day of keeping informed of all the new things being produced in the world is very great, even in a restricted technical field; therefore it may easily happen that a thing is presented by some one as perfectly new when it has been already presented to the public by another and already applied by many. Knowing this, I would not have disturbed you if the thing had not happened to me twice within a very short interval of time.

First: In the ELECTRICAL WORLD of Jan. 19, 1918, E. G. Barrington of the Toronto Hydroelectric Commission describes a method of "Obtaining Power Factor by Use of Wattmeter" which is substantially the same method described by me, together with Ing. Guastalla, and published in 1912 in the *Atti dell' Associazione Elettrotecnica Italiana*, Vol. XVI, page 99. The system was patented by us, Italian Patent No. 119,889, Vol. 88, on Sept. 9, 1911, and has had a considerable number of applications.

Second: In the ELECTRICAL WORLD of May 11, 1918, C. O. Gibbon describes a method for "Precise Measurement of Alternating Current" which is identical with that published by me as far back as 1908 in the *Atti dell' Associazione Elettrotecnica Italiana*, Vol. XII, page 291.

I shall be obliged to you if you will publish this letter to demonstrate that Italian scientific development is very badly followed abroad.

Milan, Italy. A. BARBAGELATA.

Concrete Breeching and Air Ducts in Power Plants

To the Editor of ELECTRICAL WORLD:

Sir: Referring to the article in the ELECTRICAL WORLD for Sept. 14, 1918, under the heading "Concrete May Replace Steel in Power-House Construction," I should like to offer these suggestions:

It is entirely feasible to make reinforced-concrete smoke breechings for power-house boilers, provided that certain essential features are employed; otherwise the work will prove to be a failure.

Concrete breechings, if properly reinforced and ribbed, need not be more than 3 in. (7.6 cm.) in thickness. The work will require expansion joints at suitable intervals, preferably not more than 40 ft. (12 m.) apart. These may be made of corrugated strips of sheet iron—"accordion fashion"—or may be constructed of suitable metal sliding plates.

The concrete on all sides must be exposed to free radiation, and the draft of the stack should draw in a small amount of air through its walls to keep them cool.

I have seen concrete flues constructed against brick walls or underneath the dirt floor which quickly went to pieces, owing to the concrete calcining from the heat of the waste gases. Where constructed so as to be ventilated on all sides, no failures have resulted from this method.

The concrete mixture should be made rather rich in cement, and the aggregates should preferably be of sandstone or other low calcium stone. It is preferable to use form work and cast the concrete around the reinforcement rather than to attempt to plaster up into position.

Reinforced-concrete air ducts for turbo-generators are quite successful and may be most easily constructed by means of expanded metal lath plastered on both sides with concrete mortar. They thus need not be more than 1½ in. (38 mm.) thick. Complicated curves and turns for air flues are much more easily formed in this manner than when the method followed is that of using steel-plate construction.

W. E. MOORE.

President W. E. Moore & Company, Pittsburgh, Pa.

Readers' Views and Comments

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

MANUFACTURERS MUST USE SUBSTITUTES FOR BRASS

Makers of Electrical Supplies Hold Meetings in New York to Take Steps to Face the Serious Emergency

On the call of A. W. Berresford, a meeting of the manufacturers of supplies was held at the offices of the Associated Manufacturers of Electrical Supplies, New York, on Oct. 19. Representatives of about twenty-five manufacturers attended.

Mr. Berresford explained at length the situation in connection with the production of brass and also his conference with Everett Morss, chief of the brass section of the War Industries Board and a member of the Priorities Division. He stated that owing to the influenza and for other reasons brass production had been reduced to less than 50 per cent basis of production by the mills and that the situation was so extreme that Mr. Morss announced that unless the manufacturers took up at once the matter of the substitution of steel and other metals for brass in every possible case it would be absolutely necessary for him to issue definite instructions that orders could be filled only if accompanied by a permit stating the general purpose for which the supplies were wanted.

Mr. Berresford gave figures as submitted by Mr. Morss, showing the production and also the daily amounts or demands of the government for ordnance and other purposes, together with the increase in the munition demands and the seriousness of the situation by reason of the lessened production. He stated that Mr. Morss was very positive as to the necessity for drastic regulations and complete coöperation by the manufacturers in the matter of substitution and extreme substantial reduction in the amount of brass used.

An extended discussion was held, during which J. H. Trumbull stated that he had recently had an interview with Mr. Morss and that Mr. Berresford had in no way overstated the situation. He suggested that each manufacturer take up the problem and report at an early date what percentage of saving in brass could be effected in his product by the substitution of other metals.

Mr. Berresford suggested that each group should meet at once and discuss eliminations and substitutions and be prepared to make a report during the ensuing week. He said that this matter was more important than conservation and that if reports were prepared and ready for presentation to Mr. Morss he felt confident that he could get the matter before him without delay. He added that he would be in New York on Oct. 28 to take up decisions of groups to present to Mr. Morss.

In the absence of Mr. Dallam of the wiring devices group Mr. Barton suggested calling the groups together with the factory men and issued a call to the wiring devices group, embracing about seventy-five manufacturers, to attend a meeting at the offices of the association on Oct. 23.

Other groups took similar action, and on further discussion the following were decided upon as subjects to be considered and upon which definite statements should be made:

Average monthly consumption past six months.

Percentage reduction possible; time necessary to effect.

Character of substitute and amount required: copper, steel, zinc, etc.

Wherever possible indicate uses which may be specified for prohibition.

Mr. Trumbull suggested, in order to facilitate the work, that reports should be made on a tonnage basis, including average per month, stock in hand and complete list of eliminations of brass by substitution of other metals.

In accordance with the call, manufacturers of wiring devices met at the office of the Associated Manufacturers of Electrical Supplies on Oct. 23 and agreed that the reduction in the consumption of brass should be accomplished by substitutions as indicated in the accompanying schedule.

J. C. Dallam, chairman of the wiring devices group, has asked manufacturers to go over this carefully and have their reports made out to reach the office of the Associated Manufacturers of Electrical Supplies not later than 9 a.m. on Oct. 28.

SCHEDULE FOR THE SUBSTITUTION OF OTHER METALS FOR BRASS

A—SOCKETS AND RECEPTACLES:

1. Screw shells—copper.
2. Reinforcing rings and terminals—copper (unless subjected to rubbing contact).
3. Screws for binding and clamping—steel (protected where the device is intended for installation in damp places).

B—ATTACHMENT PLUGS AND RECEPTACLES:

4. Screw shells—copper.
5. Swivel plugs—copper for interior parts.
6. Receptacles—copper for interior parts except spring contacts.
7. Flush plates, without doors, up to and including three-gang—steel, properly protected.

C—SNAP SWITCHES:

8. Screws for binding and clamping—steel (protected where the device is intended for installation in damp places).
9. Shunts—copper.
10. Flush plates, up to and including three-gang—steel, properly protected.
11. Binding posts—copper (where mechanical difficulties do not prevent and where there is no rubbing contact).

D—KNIFE SWITCHES:

Combination Switches:

12. Screw shells—copper.
13. Shunts—copper.

14. Terminals—copper.
15. Screws, binding and clamping—steel (protected where the device is intended for installation in damp places).
16. Washers, spring hinges—steel.

All Other Types:

17. Except for the current carrying nuts on 30-amp. and 60-amp. back-connected devices, no brass shall be used other than castings.

E—FUSES AND CUT-OUTS:

Fuses—Plug Type:

18. Caps—zinc, copper or steel.
19. Screw shell—copper.

Fuses—Non-Renewable—Ferrule Contact:

20. All current-carrying parts except ferrules and fusible elements—copper.
21. Non-current-carrying parts—steel (properly protected where necessary).

Fuses—Non-Renewable—Knife-Blade Contact:

22. All current-carrying parts except fusible elements—copper.
23. Non-current-carrying parts—steel (properly protected where necessary).

Fuses—Renewable—Ferrule Contact:

24. All current-carrying parts except ferrules and fusible elements—copper.
25. Non-current-carrying parts—steel (properly protected where necessary).

Fuses—Renewable—Knife-Blade Contact:

26. All current-carrying parts except fusible elements—copper.
27. Non-current-carrying parts—steel or brass castings.

Cut-out Bases:

28. Screw shells—copper.
29. Shunts—copper.
30. Terminals—copper.
31. Lugs—copper (not to be made from tubing) or brass castings.
32. Screws, binding and clamping—steel.

Back-Connected Terminals:

33. Except for the current-carrying nuts on 30-amp. and 60-amp. sizes, no brass other than castings shall be used.

PRODUCTION CURTAILED IN VARIOUS INDUSTRIES

Products in the Electrical Manufacturing Industry Affected by New Order of the War Industries Board

In announcing the necessity of curtailment of production in products of various industries the War Industries Board on Oct. 17 appealed to manufacturers to urge all workers who can be spared to go into the war industries and to coöperate with the United States Employment Service in so directing them.

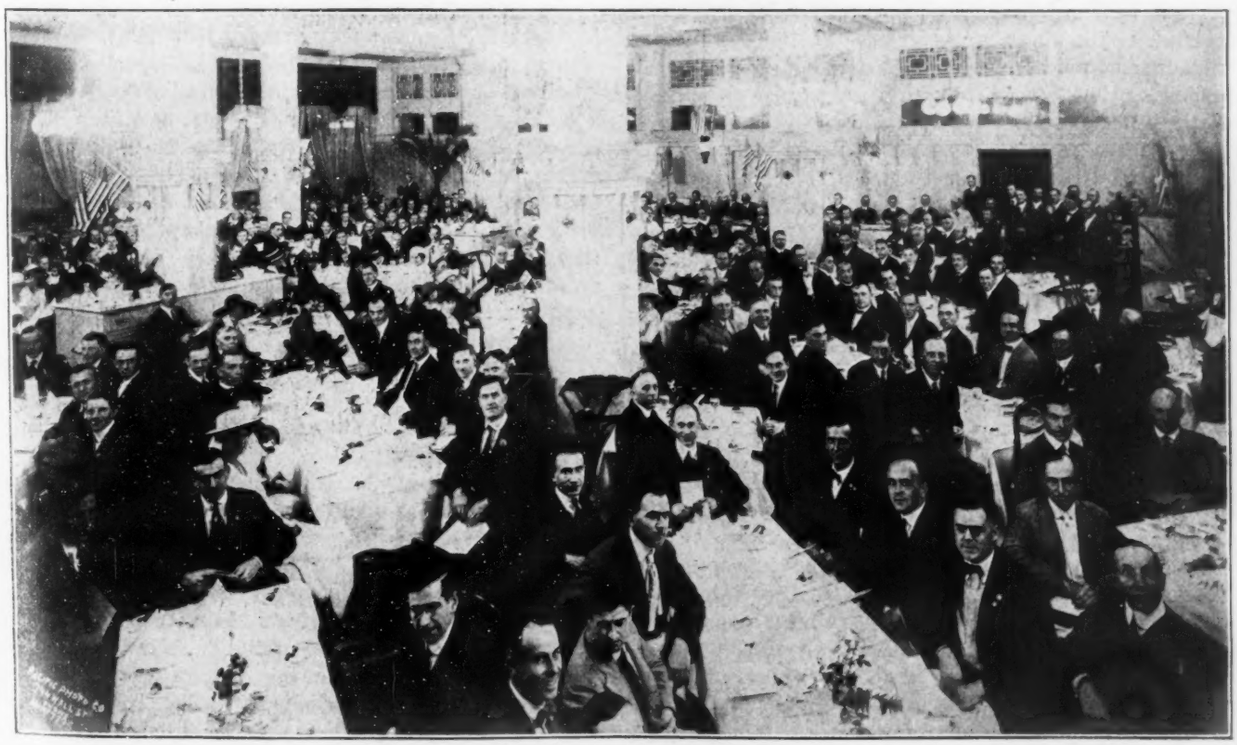
Among the products affected by the new order are: Electric fans curtailed to 40 per cent of 1917 production; electric vacuum cleaners, for six months from Oct. 1, curtailed to 75 per cent of six months of 1917 production; builders' hardware, for six months from Oct. 1, curtailed to 40 per cent of tonnage used in 1917 production.

MUNITIONS PATENT BOARD IS FORMED AT WASHINGTON

Secretary of War and Secretary of the Navy Create Agency to Consider Patent Questions Affecting Their Departments

The War Department authorizes the following:

For the purpose of coördinating the policies of the War Department and the Navy Department in patent matters the Secretary of War and the Secretary of the Navy have established the Munitions Patent Board. The membership consists of Thomas Ewing, who has been jointly selected by the Secretary of War and the Secretary of the Navy; Max Thelen, representative of the War Department, and Pickens Neagle, representing the Navy Department.



SUCCESSFUL "GET-TOGETHER" DINNER OF ELECTRICAL MEN IN LOS ANGELES, CAL.

SERIOUS EFFECT FROM THE SPANISH INFLUENZA

Epidemic Has Made It Difficult for Central Stations to Maintain Service of the Usual Standard—Conditions in Various Cities

The disastrous epidemic of Spanish influenza, fortunately now abating, has made it difficult for the already depleted forces of central-station companies to maintain service at the usual standard. Reports to the ELECTRICAL WORLD from different sections of the country show a wide variation in the amount of sickness among employees and the consequent additional labor borne by those remaining on duty. In some places the number of employees affected was slight, while in others it was large.

In New York City the effect of the epidemic was less than in many of the smaller cities, and it was felt more in the outside forces than in the office organization. In the up-state cities of New York, however, the epidemic brought serious sickness to large numbers of the employees of companies, touching both executives and workers in the outside and inside organizations. Operating forces in companies in central New York were therefore greatly reduced. In one city it was stated that one-half of the outside organization was away on account of the sickness.

EFFECT IN NEW ENGLAND CENTRAL STATIONS

In New England the loss of life in central-station circles from influenza and its complications has been small, although the epidemic has been widespread and is still to be reckoned with in many communities. The operation of generating plants has been maintained in some cases with from one-quarter to one-third of the staff absent, and much devoted service has been rendered in these and other departments in order that the most important work might be kept going. So far as can be learned, not a single government plant, munitions establishment, power or lighting customer in New England has called in vain for the usual service as a result of the epidemic. The number of employees out in various companies at the time of influenza peak has differed widely, runing from 5 to 20 per cent of the total payroll in representative instances.

The Boston Edison company reports 610 cases to Oct. 19 among 2000 employees, the maximum number out at once being 216. On Tuesday last there were but sixty-nine out, none of whom was understood to be dangerously ill. Six employees lost their lives.

Out of the two largest Stone & Webster central stations in New England, one life was lost at Lowell, Mass., and none at Brockton, Mass. At Lowell the generating station was operated for about two weeks by two-thirds of the normal staff, and at Manchester, N. H., it became necessary to operate the plants on two twelve-hour daily shifts in place of the usual eight-hour shifts. Eight out of thirty-two generating-station employees at Brockton were out at the climax. On the Manchester system five employees, including railway department men, out of a total of about 260 persons on the payroll, died. At the maximum period about 20 per cent of the employees were on the sick list. At Cambridge, Mass., the maximum number out was twelve, out of 125 employees, with no lives lost.

The Worcester (Mass.) Electric Light Company, with 225 employees, lost one. About 5 per cent was the maximum number out, the generating plant being particularly hard hit. No employees in the electrical departments of the properties operated by C. H. Tenney & Company, Boston, lost their lives, and about 10 per cent represents the maximum number out. At Providence, R. I., about 5 per cent of the 450 employees of the Narragansett company were out at the maximum time, but all recovered. On the Cumberland County Light & Power Company's system, Portland, Me., all employees recovered after illness, the railway branch of this service being hardest hit. The epidemic was slower in reaching Connecticut, and while it has been prevalent there, the mortality in electrical circles appears to have been very low to date.

It is too early to secure accurate estimates of the loss of business due to the epidemic in New England. An analysis by the ELECTRICAL WORLD of the energy consumption of ninety-three motion-picture houses in the Boston district which were closed for about two weeks indicates that not far from 150,000 kw.-hr. was not taken as the result of the ban on entertainments in these establishments. Saloons, churches, lecture halls, bowling alleys and other places included in the closure might easily bring this total to 250,000 kw.-hr. unsold in the fortnight ended Monday morning. In one day the load at Malden, Mass., fell off 800 kw. owing to factory closing, but this condition lasted only a few days. Probably 25,000 kw.-hr. was unsold because of the closing of motion-picture houses. At Worcester the loss of business appears to be not over 5 per cent for the past fortnight, and in Providence about 3 per cent. At the latter city the load dropped about 15 per cent last week compared with normal conditions. In general, factories have been kept running, though often with depleted personnel.

The worst appears to be over, and it looks as though by the first of next week northern New England would return to open conditions, as Boston did on Monday. Elsewhere in the Northeast such curtailments as remain are likely to be of comparatively short duration. Executives and employees have responded finely to the call of the emergency upon their personal reserve powers, and once more the industry has cause for pride in the maintenance of high-grade continuous service in the face of severe handicaps, which easily may have been accompanied by the production of half a million kilowatt-hours less per week in the New England States as the direct result of the epidemic.

PACIFIC COAST CONDITIONS

The Pacific Gas & Electric Company, San Francisco, reports that so far as it is concerned there have been only a few cases of Spanish influenza, 5 per cent or less of the employees being affected. Thus far there has been only slight inconvenience in the operation of the electric system. The Sierra & San Francisco Power Company reports that approximately 15 per cent of the operating staff is affected, which leaves the organization pretty well crippled. Much difficulty is experienced in the reading of meters, getting district office work out and in operation of plants generally. The Great Western Power Company reports a very small percentage out as yet. It has had no trouble in operating.

A report from a representative of the ELECTRICAL WORLD in Portland, Ore., says that doubtless October earnings of all central stations will show more or less falling off on account of the epidemic. The ban on all public meetings and special sales has reduced lighting income $600 to $700 daily in Portland. Street-car travel has dropped 16 per cent. Soldiers are forbidden to use street cars. The number of central-station absentees on account of sickness is negligible. Seattle reports practically no effect on operation of property there, except decrease of street-car travel. Preventive measures, not actual sickness, cause such losses as are noted.

CHICAGO NOT SERIOUSLY HAMPERED

Influenza has not seriously hampered the organization of the Commonwealth Edison Company. Some of the employees have been very ill, and there have been days when the absentees reported in some departments were 100 per cent above the usual figure; but in comparison with other concerns in Chicago the central-station employees have not suffered in large numbers. The most difficult situation was created by the shortage of nurses. Individuals were unable to secure them. Realizing this fact and wishing to be of real assistance to its employees, the company secured the services of several nurses in addition to those on its regular staff. These girls went from house to house of the employees reporting influenza and rendered such expert aid as was possible. Their work helped many families get properly started in taking care of the sufferers. Accurate information on the exact percentage of absentees cannot be obtained until the monthly reports of department heads are made.

MUNICIPAL ELECTRICIANS IN MEETING AT ATLANTA

International Association of Municipal Electricians, at Its Twenty-third Annual Convention, Tenders Services to the Government

The twenty-third annual, or "win the war," convention of the International Association of Municipal Electricians, held at the Piedmont Hotel, Atlanta, Ga., on Sept. 24 to 27, developed many interesting papers and discussions.

The character of the papers read and the discussions that followed hinged to a considerable extent on conditions caused by the war or growing out of it. Fire prevention was one of the subjects that came in for a good deal of discussion, while the report of the municipal standardization committee, which was adopted, was regarded as a matter of great importance. Discussion of a paper on "A Code of Electrical Rules Covering Both Fire and Accident Prevention," by Dr. M. G. Lloyd of the Bureau of Standards, also constituted a prominent feature of the meeting. It was decided to hold the 1919 convention at Chicago, the date to be announced later.

A resolution adopted by the association tendered the services of its members to the federal government in whatever capacity they can be used to help win the war. In inviting conferences with government officials, the resolution recited the facilities for fire prevention and protection in the hands of the members in the various cities throughout the country, already well organized, that are available for federal organizations concerned in war activities. The resolution also declared that already in some municipalities the facilities of the electrical inspection departments have been placed at the disposal of federal authorities. The fact that federal representatives in some localities have apparently remained uninformed of facilities available prompted the adoption of the resolution, especially where attempts at ineffective duplication of facilities have been made or the utilization of such facilities has been neglected.

RECOMMENDATIONS OF EXECUTIVE COMMITTEE

Among the recommendations made in the annual report of the executive committee were the following: That a committee be formed to be known as the jurisprudence committee, that some plan be developed by which the exhibits may be made more interesting from an educational viewpoint, and that the association provide an exhibit consisting of samples of peculiar or chronic cases of electrical trouble experienced from time to time. Members should supply such samples, accompanied by a brief description of the cause, together with a remedy for it, and a place should be provided on the program for discussing the matter. The exhibit referred to would, of course, be in addition to the regular exhibits made every year by manufacturers and others.

The convention also went on record as being opposed to the use of unprotected knife switches and recommended enactment of the necessary legislation to compel the use of approved inclosed knife switches operated from outside of the box.

The report of the standardization committee on standards for municipal electrical departments aroused much interest and considerable discussion, especially as regards specifications for underground cable, which were adopted as standard by the convention for underground use in fire and police signal systems.

The attendance at the convention, while not so great as in former years, was better than had been expected owing to war conditions and was well distributed from all sections of the country, one delegate being present from Canada.

A paper that attracted much attention was that read by Washington Devereaux of Philadelphia, chief of the electrical department of the Philadelphia Fire Underwriters' Association, on "How the Municipal Electricians Can Help in Fire Prevention." In referring to the subject he said, "We need more education instead of legislation." He declared that grave responsibility rests on the city electricians and that fire prevention is the most vital question of the day, because on it will depend winning the war.

Dr. M. G. Lloyd of the Bureau of Standards, Washington, who described what was being accomplished in preparing a code of electrical rules covering both fire and accident prevention, said the federal government would render all aid in its power in effecting the installation of safety appliances, especially in plants engaged in war contracts. Safety standards would be insisted on in such plants. "It means new safety rules, and the owners of such plants will have to live up to them," he said.

ILLUMINATING ENGINEERING SOCIETY WORK IN THE WAR

Activities Range from Lighting and Signaling in Trench Warfare to Speeding Industries by Means of Good Lighting

The twelfth annual convention of the Illuminating Engineering Society, held Oct. 10 in New York City, brought out the fact that all members of the society are on the war service committee, and thus the entire technical knowledge and experience of the membership is made effectively available to the government. The program was decidedly of war color, dealing principally with illumination in the war zone and the speeding of production in our industries by good lighting. As expressing the unanimous opinion of the convention, the following telegram was dispatched to President Wilson:

"Resolved, That the Illuminating Engineering Society, in twelfth annual convention assembled this day in New York City, desires to extend to the President of the United States and all others in authority the assurance that in its organization and its membership it is in thorough accord with the fixed determination of the American people and their chosen representatives to prosecute the war with the utmost vigor and to a victorious conclusion."

Indicating some of the war problems undertaken by the society and summing up its activities during the past year, President G. H. Stickney said in part:

"In the trenches or on the sea light can be used to reveal the enemy and often to confuse him, and an advantage in these respects may turn the tide of battle. Further, light is an important means of signaling both by day and by night. In caring for and supplying an army effectiveness depends in a large degree upon light. If the movements near the front could be illuminated for the benefit of the traffic without revealing it to the enemy, there would be a remarkable gain. In transportation on land and sea, and in production at the workshop and mine, properly applied light is an essential factor."

GOOD LIGHTING ESSENTIAL IN WAR INDUSTRIES

In dealing further with illumination both for speeding output and for protection, Mr. Stickney said:

"In the past the government's interest in industrial lighting was principally concerned with the prevention of accident and conservation of eyesight. To-day it is imperative that each worker produce to the maximum and that many of them do so at times and in places where daylight is absent or insufficient. It is therefore nationally important that an effort be made to improve industrial lighting. The society and its members are leading in a movement for better industrial lighting. Our committee on lighting legislation has been doing much of the pioneer work. Let us accelerate it as much as possible.

"Protective lighting is still of unusual importance, and will be so long as there are among us murderous and desperate enemy sympathizers who are seeking secretly, under cover of darkness, to interfere with our manufacturing and other activities. A slight explosion at a vital part may temporarily stop a large industrial plant or transportation line. With our complex institutions protective lighting is likely to retain a certain importance, even after the war; now it is indispensable. The pamphlet on protective lighting prepared by our committee on war service and published by the War Department is one of our important contribution toward winning the war.

"In this connection we must remember that street lighting always has been in the past a protective measure, and while in recent years a small part of it has acquired certain ornamental and advertising features, street lighting as a whole is still protective lighting, and as such cannot be reduced or eliminated without accident and criminal hazard. By warning those in authority we may be instrumental in preventing disorder and even disaster."

Further, regarding fuel conservation, Mr. Stickney said: "At the request of the United States Fuel Administration, received through the National Committee on Gas and Electric Service, our committee on war service has been studying the possibilities of fuel conservation in connection with illumination. The elimination of extravagance and waste we could heartily subscribe to as tending to develop the art of lighting and put it on a more stable basis. We have looked upon the restriction of useful lighting, even for commercial or advertising purposes, as a destructive measure, containing possibilities of injury and injustice. However, when advised of the necessity, we have heartily coöperated, even to an extent which may pull down part of the structure of lighting practice of which we are so proud. But when we balance the lives of American soldiers against lighting comforts and refinements—as the Fuel Administration tells us we must—there is but one answer.

"We believe that no curtailment of useful industrial or protective lighting can be made without loss of production or danger to operatives. Reduction of useful commercial lighting will work some hardship and relatively small fuel saving. So that it seems apparent that the end sought is to utilize the psychological effect in securing economy in other fuel applications."

COMMITTEES REPORT PROGRESS

After listening to the president"s address reports of committees were taken up. F. E. Cady, chairman of the committee on progress, gave a summary of the work of the past year. It was stated that the use of carbon lamps in this country has increased in spite of the well-known superiority of more modern lamps. This was attributed to the policy of free renewal of carbon lamps only. Aside from the developments for use in connection with the war, one of the most important achievements of the year has been the successful application of the gas-filled lamp to motion-picture machines. A special camera is being made also for taking pictures at the rate of 500 per second.

In the absence of Dr. A. E. Kennelly, chairman of the committee on nomenclature and standards, the report was presented by Dr. C. H. Sharp. Regarding this report Dr. E. P. Hyde said that it showed far greater progress than had been made by any other country. As president of the United States national committee of the International Commission on Illumination, Dr. Hyde then made a statement for his committee, saying that preparations were under way for resuming this work, which was interrupted by the war. F. M. Hugo,

Secretary of State of New York, then explained how the highways were being made "safe for democracy" through the coöperation of members of the I. E. S. He said that the number of automobile licenses in the state had risen from 173,000 to 465,000 within the last three years. The chief problems were to control the careless driver and to eliminate glaring headlights. Dr. Sharp, for the committee on automobile headlighting specifications, described photometric road tests and assured the membership that the roads would be well lighted and rid of glaring headlights.

INDUSTRIAL LIGHTING CODES

In several states industrial lighting codes have been put into effect or are in preparation, namely, Pennsylvania, New Jersey, New York, Wisconsin and Ohio, according to L. B. Marks, chairman of the divisional lighting committee. Capt. Lloyd M. Scott explained that a liaison officer had been appointed by the general staff to keep it informed of war problems for which solutions were sought so that these might be turned over to the war committee of technical societies. The principal problems handled by the Illuminating Engineering Society had so far been connected with flares, floodlighting and improving searchlights. P. S. Millar then told of service performed by members of the society serving the Signal Corps of the Army and Navy Departments, the Bureau of Military Intelligence and the United States Fuel Administration. An appeal by T. C. Martin for support of the fourth Liberty loan ended the morning session.

Of the papers presented at the afternoon session those by W. A. Durgin, R. E. Simpson and the committee on war service will be abstracted or digested in future issues.

Included in the program was a blackboard talk on "Lighting of Cantonments" by Bassett Jones. Mr. Jones gave a résumé of observations made in traveling through navy camps in the East. He asked particularly that these be cured of the "drop-cord fever," indicating that there was a serious lack of general illumination in many places due to entire reliance on drop cords supporting cheap reflectors or "tin shades." He had even seen combinations of this sort in hospitals. In some places these conditions have been corrected.

Edmund Leigh, chief of plant protection, Bureau of Military Intelligence, gave an interesting talk, crediting the I. E. S. with great assistance in protecting important war industries from destructive agents. He said the essentials of plant protection consisted principally of good fences, good lighting and good watch service.

PATRIOTISM RIFE AT WAR SUPPER

As master of ceremonies at the war supper D. McFarlan Moore interspersed patriotic songs with speeches by G. H. Stickney, retiring president; Dr. G. A. Hoadley, the new president; O. Monnett of the Fuel Administration and Lieutenant-Colonel Millikan, now of the National Research Council at Washington. Mr. Monnett made a very lucid and straightforward statement of the necessity for lighting curtailment and told of the enormous demands for fuel. Lieutenant-Colonel Millikan spoke on the subject "Research of America." He reminded the audience that the United States has so far had but a small part in the war and deprecated loose talk concerning our own achievements. In the matter of scientific development he said that our country is undoubtedly a second-class power and pointed to the honored position of the royal societies in England as an example for us. He forecasts the establishment of great research agencies in this country within the next two years, believing, as he does, that our position in the front rank of industrial nations after the war depends upon greatly stimulated research work.

ESSENTIAL INDUSTRIES FINANCE CORPORATION

Representatives of Westinghouse Electric & Manufacturing Company and General Electric Company Are on the Board of Directors

The newly formed Essential Industries Finance Corporation has completed organization in New York. Eugene V. R. Thayer, president Chase National Bank, was elected president. Gerhard M. Dahl, vice-president Chase National Bank, and Frederick Strauss of J. & W. Seligman & Company were elected vice-presidents. The directors include the officers and the following: E. B. Sweezy, First National Bank; Frederic W. Allen, Lee, Higginson & Company; Harold Stanley, Guaranty Trust Company; Thomas W. Lamont, J. P. Morgan & Company; Sidney Z. Mitchell, Electric Bond & Share Company; O. D. Young, General Electric Company; E. W. Clark, E. W. Clark & Company, Philadelphia; James N. Wallace, president Central Union Trust Company; John Hays Hammond, Randal Morgan, Guy E. Tripp, chairman Westinghouse Electric & Manufacturing Company, and Willard V. King, president Columbia Trust Company.

As stated in the ELECTRICAL WORLD of Sept. 28, the corporation will aid in financing utilities and other essential industries. Its initial capital is $3,000,000, and that may be increased to $20,000,000.

An Echo of Gasolineless Sundays

Owners of electric and steam-driven automobiles were practically the sole occupants of Chicago's boulevards on the recent gasolineless Sundays. Public sentiment against Sunday driving was so strong that even some electric cars were stopped before the electric car dealers furnished their customers with signs like those shown in the photograph. Needless to state, the electric car business has improved wonderfully of late.

CHANGE IN DATE FOR THE CONFERENCE CLUB MEETING

Conditions Adverse to Gatherings at the Present Time Lead to Its Postponement to Nov. 21, 22 and 23

Owing to the difficulties encountered by all those attempting to hold meetings at this time, the executive committee of the Conference Club has decided to postpone the Pittsburgh meeting to Nov. 21, 22 and 23.

SUBSCRIPTION TO THE FOURTH LIBERTY LOAN

McGraw-Hill Company, Inc., Publisher of the "Electrical World," Subscribes for $1,035,000 for Itself, Officers and Employees

The McGraw-Hill Company, Inc., publisher of the ELECTRICAL WORLD and the associated technical papers, subscribed, on behalf of the company, the officers and the employees, for $1,035,000 fourth Liberty loan bonds.

WAR SERVICE BULLETIN OF THE MANUFACTURERS

General War Service Committee of the Electrical Manufacturing Industry Issues Bulletin Giving Information to Manufacturers

No. 1 of a *News Bulletin* has been issued by the General War Service Committee of the Electrical Manufacturing Industry. It is issued for the information of every electrical manufacturer and contains data regarding rulings at Washington, etc. The committee calls attention to the fact that the information "may be of only temporary value because of rapidly changing conditions due to present circumstances."

WATER-POWER PLANTS AND LIGHTLESS NIGHT ORDER

Companies in New York State Are Asked by Fuel Administration to Observe Same Regulations as Coal-Consuming Systems

Two hundred lighting companies in New York State hitherto not included in "lightless night" orders, because they generated electricity from water power and not coal, were requested recently by the United States Fuel Administration to observe the same restrictions as the companies using coal. Claims of discrimination "by those communities served from steam plants which adjoined those served by water-power plants," as well as the effect of universal observance of this government order, were assigned by the Fuel Administration of New York State as reasons for asking the Empire State Gas and Electric Association to convey this request to the water-power plants of the state.

"We will convey to every one of the water-power plants in this state this official request," said C. H. B. Chapin, secretary of the Empire State association. "We have coöperated closely with every government rule to win the war thus far and shall continue to do so, in spite of the big burden that present conditions impose on every one of our members."

URGE THE CONSERVATION OF CONDENSER TUBES

Requirements of Navy and Emergency Fleet Corporation So Large that There Will Be at Best a Very Small Supply for Others

M. Greenberg of the electrical and power equipment section of the War Industries Board has addressed the following letter to George W. Elliott, secretary National Committee on Gas and Electric Service:

"1. As you are aware, the requirements of the navy and the emergency fleet for non-ferrous condenser tubes are so large that the indications are that there will be none, or at best a very small supply, of such tubes available for repairs on land condensers.

"2. May we not therefore suggest that you emphasize the seriousness of the situation to the members of your association and urge upon them the necessity of conserving their condenser tubes in every possible way?"

ABANDONS PLAN TO EXTEND THE DAYLIGHT-SAVING LAW

Senator Calder Withdraws His Measure Because of Opposition—Clocks to Be Turned Back One Hour on Oct. 27

Senator Calder has abandoned his bill to make the "daylight-saving" law operative throughout the year. It had been passed by the Senate, but not the House.

In accordance with the original law, clocks will be turned back again one hour on Oct. 27. The official change in time takes place at 2 a.m.

The Fuel Administration, in estimating the coal saving from operation of the law, says:

"It was shown that in one district the saving of coal was 17½ tons per 1000 population over the period of seven months. These figures were checked against records obtained from other places in widely separated districts having the same relative conditions, and from the mass of facts thus gathered the estimate of 1,250,000 tons of coal saved is determined."

The Daylight Saver

He has fooled himself
Since the first of April,
And he wants to continue
To fool himself
And others
Around the complete cycle
Of a year.
He offers us statistics
To show that
Mauy million tons of coal
Have been saved
And that many million more
Will be saved
If we are content
To arouse ourselves
During the darkling morning hours
Of the winter,
And to begin the day
Before the sun has risen.
But his mere claim proves nothing
And will be of no avail
Until he can show
Why artificial light in the morning
Is cheaper than in the evening.

—"E. F. E." in Boston *Transcript*.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Electric Club of Philadelphia.—On Oct. 17 the Electric Club of Philadelphia held a meeting to promote subscriptions to the fourth Liberty loan.

San Francisco Electrical Development League.—"Leadership in Russia" was the subject of an address by Prof. Alexander S. Kaun of the University of California given at the Oct. 9 meeting of the San Francisco Electrical Development League.

Northwest Electric Light and Power Association.—L. B. Faulkner of the Olympia Light & Power Company is unable to accept the presidency of the Northwest Electric Light and Power Association, to which he was recently elected. The place will be filled by another election in the near future.

N. E. L. A., New England Section-Massachusetts State Association of Contractors and Dealers.—Members of the New England Section of the N. E. L. A. and the Massachusetts State Association of Contractors and Dealers witnessed the United States War Department official "V. D." films called "Fit to Fight" at the Boston City Club on Oct. 24. President Emeritus Eliot of Harvard University occupied the chair, and Major A. N. Thomson and Dr. Russell B. Sprague were the chief speakers.

New York Jovian League.—One hundred and fifty members of the New York Jovian League, lunching at the Hotel McAlpin, raised $30,000 in support of the fourth Liberty loan in less than thirty minutes. Inspiring talks were given by Lieut. John Quinney of the Canadian Mounted Rifles, Theodore Beran, J. M. Wakeman, T. C. Martin and Congressman Caldwell of New York, who said that it would cost at least $100,000,000,000 to place an army of 5,000,000 men in France and keep it there until the Prussian menace is ended.

A. I. E. E., Toronto Section.—The Toronto Section of the American Institute of Electrical Engineers held an informal discussion on the subject of "The Grounded Neutral" at the Oct. 4 meeting. The discussion was participated in by a number of prominent engineers associated with the Hydro-Electric Power Commission, the Toronto Power Company and other organizations. The question of the amount of resistance, if any, in the grounded circuit was discussed in detail, as was also the effect of the various systems on telephone lines. The departure from the usual program of a formal address on some single subject proved to be a popular one.

Toledo Joint Company Section.—Employees of the Toledo Railway & Light Company and associated companies, representing gas, railway and electric lighting interests, opened the year's work with a minstrel show attended by more than 800 persons. This meeting not only served to attract employees to the section meetings for the coming winter but also to provide a social attraction designed to help keep men and women interested in and contented with their environment, thus reducing the labor turnover incident to war conditions. George E. Lafferty is secretary of the joint section.

Association of Electrical Contractors and Dealers of Oregon.—A meeting of the Oregon State Association of Electrical Contractors and Dealers was held in Portland on Sept. 20 and 21 at the Multnomah Hotel. Captain Conway, secretary of the British Columbia Association of Electrical Contractors and Dealers, gave a talk on the advantages of the association. Roy C. Kenny presided at the open meeting, at which B. W. Paul of Medford read a paper on "Proper Electrical Retail Merchandising," Charles H. Carey, local chairman of the War Industries Board, gave an outline of its activities, and George L. Oman, Northwest manager for the Pacific States Electric Company, and C. P. Scott, of the Scott Electric Company, read papers.

National Association of Stationary Engineers.—Considerable attention was given the subject of fuel conservation by the National Association of Stationary Engineers in convention at Cincinnati, Ohio, recently. Although observing the requests of the Federal Fuel Administration strictly, many factories really deprive themselves of material savings through imperfectly planned lighting systems and faulty arrangement of equipment, it was said. Henry Missistow, chief engineer of the Indiana Steel Company, Muncie, Ind., discussing this subject, said: "Unnecessary partitions are permitted to obstruct windows in many factories. Machines, workbenches and other contrivances which might be used to better advantage if rearranged are permitted to shut off light. By giving careful attention to shop plans and arrangements, by keeping windows in good repair and by keeping them clean much light, often wasted, may be saved. By placing artificial lights according to plans, instead of simply scattering them about the shop, they can be made much more useful, and many otherwise required might be eliminated without violation of the rules of safety." William Reynolds, Hoboken, N. J., speaking on "Efficiency in Officership," said that the officers of industries are more responsible than the workmen for the conservation of fuel. He urged that the heads of concerns inquire more closely into the manner in which foremen conduct their departments and discharge immediately those who are careless in the observation of the Fuel Administration's requests.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Increased Rates at Chester, Ill.—The Illinois Public Utilities Commission has authorized the Southern Illinois Light & Power Company to increase its rates temporarily in Chester, Ill. The commission in establishing rates found the value of the property to be $50,000, the operating revenue $20,000 and the operating expenses $15,325. The commission established depreciation at 4¼ per cent with an allowable return at 5½ per cent. The rates established for lighting range from 15 cents to 8 cents with a one-dollar minimum bill and for power from 7 cents to 3 cents with a one-dollar minimum bill.

Massachusetts Telephone Decision Affecting Hotels.—After Nov. 1 hotels are to be forbidden to resell telephone service at a profit, according to a decision of the Public Service Commission in the so-called Boston hotel rate case. The commission investigated the practice of charging 10 cents for pay-station calls in hotels instead of the standard local rate of 5 cents for the inner metropolitan district exchanges. The board concludes that hotels have no right under existing laws to retail telephone service at a profit and sets forth the opinion that the fundamental relationship between innkeepers and the public forbids the practice.

Extensions in War Time.—A decision of the Missouri Public Service Commission affecting rules and regulations governing extensions of electric service of the Empire District Electric Company says in part: "We believe the rule generally in force in pre-war times is the correct rule—that utilities should ultimately bear the cost of all extensions and that such cost should become part of the capital investment of such utility upon which the entire consuming public within the territory covered by the franchise and operations of such utility should pay rates for service sufficient to afford a reasonable return to such utility upon the capital actually invested therein. . . . It is more fair to distribute the burden among all consumers than to place it on the few who are so unfortunate as to require such service under present conditions. We know of no rule granting low rates or more favorable terms to consumers requiring extensions in times of abnormally low prices. No utility has been completely built with all its distribution plant at uniform prices. New consumers will be penalized by the requirement that they deposit a large portion of the cost of extensions, thus being placed in the position of being compulsory lenders of capital to the utility."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Commonwealth Edison Section, N. E. L. A., Ceases Activities.—For the duration of the war the activities of the Commonwealth Edison Section of the National Electric Light Association will be suspended. This decision was reached by the executive committee of the organization at a recent meeting. The present officers of the section, A. G. de Clercq. W. L. Sees, W. A. Fox and E. S. Butt, were appointed to serve another year on account of their familiarity with conditions surrour.ding the work of the section.

Popular Lecture on Protective Lighting.—The third of a series of popular lectures prepared under the auspices of the committee on popular lectures of the Illuminating Engineering Society is now ready for presentation. It is entitled "Protective Lighting" and treats of the use of light as a means of defense against damage to the industrial and military machinery of the country resulting from sabotage and acts of enemy agents in general. The treatment of the subject is popular throughout. The lecture is illustrated by thirty-four lantern slides and can be presented in an hour's time. It may be reserved for presentation upon application to the Illuminating Engineering Society, 29 West Thirty-ninth Street, New York.

Attendance at German Technical Schools.—According to the *Frankfürter Zeitung* of Aug. 27, in the eighth war semester—the summer of 1918—the eleven high technical schools of the empire had 2231 students on the rolls, as compared with 1721 in 1917 and about 12,000 at the outbreak of the war. The increase over 1917 is due chiefly to the return of students from the field, some of whom were furloughed to finish their studies, while others were invalided home. The school registers carry 10,145 names of students "on leave." Among the students in attendance were 183 women, most of whom are studying architecture or chemistry. The schools had, in addition, 916 men and 1246 women registered as "guests" (hospitants), so that the total number of persons in attendance was 4393, as against 13,000 to 14,000 in peace time. The school at Aix-la-Chapelle showed the greatest increase in the number of students, owing to a larger attendance of students from Luxembourg. Charlottenburg had 429 students in attendance, holding thus the first place, as it did in peace times. Then followed Munich, with 410 students; Dresden had 273; Aix-la-Chapelle, 253; Darmstadt, 174; Karlsruhe, 162; Hanover, 152; Danzig, 123; Stuttgart, 114; Brunswick, 75; Breslau, 66. Of the woman students Dresden had 32; Munich, 27; Darmstadt, 25; Charlottenburg, 24; Aix-la-Chapelle, 19; Karlsruhe, 14; Brunswick and Danzig, 12 each; Hanover, 6, and Breslau, 2.

More Than Three Thousand Commonwealth Edison Men Register.—Between the ages of eighteen and forty-six there are 3308 men who have registered among the employees of the Commonwealth Edison Company of Chicago. Of this number 712 are between eighteen and twenty-one years of age; 1226 are between twenty-one and thirty-one, and 1370 are between thirty-one and forty-six. The total registration includes all but 1250 of the company's employees. Of the 1250 employees 700 are women, the remainder are older men and boys under eighteen.

Serious Accident When Boys Crawl Through Fence 60 Ft. from Broken Wire.—One wire of a 13,200-volt, three-phase transmission line in Wisconsin broke not long ago and came in contact with a wire fence beneath the line. This fence was connected with another fence in the yard of a farmer. It had been raining shortly before the wire broke and three barefooted boys felt the current through their feet as they walked down the road. Two of them ran to the fence on the opposite side of the highway, and one boy in trying to crawl through the fence was instantly killed, while the other boy in trying to crawl under the lower wire was severely burned. The fence where the accident occurred had no connection with the fence which was in contact with the transmission line wire and was fully 60 ft. from it. The power plant is about three miles away. The boys were between the plant and the broken wire.

California Power Administrator Removes Lighting Restrictions.—H. G. Butler, Power Administrator of California, has sent out an announcement to power companies and municipalities in northern California removing all lighting restrictions, so far as the State Power Administration is concerned, beginning Oct. 14. The effect of this order will be that there will be five bright nights each week. Mr. Butler's order has been made possible by the rainfall in the mountains and the reservoir conditions, together with the great decrease in the use of water for irrigation. "It is barely possible," Mr. Butler stated, "that a condition might arise by which some restrictions may be necessary before the year is over, but I doubt very much if the order will be changed again. The operation of the order during the last three months has brought a wholesome result, and the timely rainfall has made me feel abundantly safe in the order just established." The federal order requiring two lightless nights a week—Mondays and Tuesdays—for the conservation of fuel is still in effect, however. Unless this order is changed these two nights will remain lightless.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Responsibility for Lineman's Gloves.—If an electric power company did not furnish gloves to its lineman, who was killed when he touched a highly charged wire, and the lineman used his own gloves, the power company is not responsible for their condition, the Supreme Court of North Carolina held in Clements versus Elizabeth City Electric Light & Power Company. (96 S.E. 652.)

Rate Discrimination.—Where rates charged by a telegraph company to some concerns are lower than the rate charged another concern, the lower rate constitutes discrimination only if the circumstances and conditions affecting the service rendered the latter are substantially similar to conditions affecting the service rendered the former, or if difference in rates is disproportionate to difference in conditions relating to the service, the Supreme Court of New York held (171 N. Y. S. 791).

Injury to Land.—In the absence of a requested modification, a charge that damages to land by the erection of a dam is the difference in value before and after the erection of the dam will not be deemed misleading because it failed to use the words "immediately before" according to the Supreme Court of South Carolina in Sullivan versus Sullivan Power Company (96 S. E. 405). A charge that the damages to land by the erection of the dam is the differencce in value before and after the erection is not objectionable as allowing damages for loss of crops.

Remedy for Landlords for Damage by Backwater.—In condemnation proceedings by a power company which had constructed a dam that had been washed out and was constructing another dam of the same height, it was competent for a landowner to prove damage by backwater of the former dam to show what his compensation should be, there being no question of damage to crops or temporary damage, it was held by the Supreme Court of South Carolina in Lockhart Power Company versus Askew (96 S.E. 685). Where condemnation is provided for taking of land flooded by dam, that remedy is exclusive, and there can be but one assessment of compensation, which is conclusively presumed to include all damages to the owner of the land, past, present and future, by reason of the taking. In condemnation of land for a dam it was not error to show damage done by a former dam of the same height where the jury was instructed to exclude any element of damage arising out of past tort of trespass.

N. A. Perry, formerly manager of the Indianapolis Light & Heat Company, is now connected with the Air Craft Board at Washington, D. C.

William D. Ray, formerly vice-president and general manager of the Pennsylvania Utility Company, Easton, Pa., has been commissioned as a major in the Quartermaster Corps, Construction Division, War Department. Major Ray's work will be that of utility officer at one of the cantonments, where he will have charge of the lighting and other utility services. His experience in the electrical industry has extended over a number of years, beginning in 1887 as wireman and station attendant with the Cicero Water, Gas & Electric Light Company at Oak Park, Ill. In the following year he became electrician with the Chicago & Northern Pacific Railroad Company at Chicago, where he stayed for three years, when he became electric light inspector for the Chicago & Northwestern Railway. From there he went with the Standard Electric Company of Chicago in 1892 as assistant consulting electrician, and in 1893 he became connected with the electrical department of the Chicago World's Fair, remaining until the following year. At that time he became general manager and superintendent of the Everett (Wash.) Railway & Electric Company, resigning in 1897 to become sales engineer of the Lorain Steel Company's Chicago office in the sale of railway material. From 1898 to 1899 he was assistant electrical engineer of the Woods Motor Vehicle Company, from 1899 to 1900 general manager C. P. Magoon Air Brake Company, from 1900 to 1904 electrical engineer Detroit Construction Company, from 1904 to 1908 sales representative of the Westinghouse Traction Brake Company, from 1908 to 1910 contract agent electrical department of Sanitary District of Chicago, and from 1910 to 1915 vice-president and general manager for the Northern Indiana Electric Company. In 1915 he joined the gas and electric light utilities of Easton, Pa., as vice-president and general manager.

W. D. RAY

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Frank E. Watts, Eastern agent for a number of electrical manufacturers, past Jupiter of the Jovian Order and former Eastern manager for the ELECTRICAL WORLD, is receiving the condolences of his many friends on the death on Monday of his wife from pneumonia following influenza.

M. L. Pomares has resigned from the department of water supply, gas and electricity of New York to become connected with the organization of William J. Shore, electrical contracting engineer of that city. Mr. Pomares, who will be assistant engineer to Mr. Shore, received his education in electrical engineering at Columbia University. He is a member of the executive committee of the National Association of Electrical Inspectors.

Obituary

Wallace B. Lindsay, head of the electrical engineerng department of Ingersoll, Rand & Company, died on Oct. 12, at his home in New York City, of pneumonia.

W. H. Fairclough, Sr., who was in the employ of the Commonwealth Edison Company of Chicago as general agent for thirty-three years, died at his home on Oct. 15 at the age of eighty-three years.

T. H. Bevan, who prior to enlisting in the Canadian Engineers in May, 1917, was superintendent of the meter department of the Central Power Company, Canton, Ohio, was recently killed in action on the western front in France.

Harry J. Pepper, general superintendent of the Urbana & Champaign Railway, Gas & Electric Company, Champaign, Ill., died on Oct. 17. For twenty-nine years he was associated with electrical interests in Champaign and Urbana, beginning with the Harris interests in 1889 and being retained by the McKinley interests when the Illinois Traction System, of which the local company was a part, was organized.

Leonard S. Cairns, general manager of the Eastern Pennsylvania Railways Company, which controls the Eastern Pennsylvania Light, Heat & Power Company, died of pneumonia on Oct. 10 at Pottsville, Pa. He was thirty-six years of age. Interment was at Minneapolis, Minn., his former home. For a number of years Mr. Cairns was general superintendent of the Twin City Rapid Transit Company of Minneapolis and St. Paul, Minn. In 1912 he resigned from the operating organization of that company to join the staff of the J. G. White Management Corporation, New York, and was assigned to the position of assistant general manager of the Manila (P. I.) Electric Railroad & Light Company. He was promoted by the management corporation in 1917 to the office of general manager of the Eastern Pennsylvania Railways Company, Pottsville.

Jonathan Camp, president and general manager of the Franklin Electric Manufacturing Company, manufacturer of the Franklin "Mazda" lamp, died at his home in Hartford, Conn., on Oct. 13, from pneumonia following an attack of Spanish influenza. Mr. Camp had been in the electrical industry for a good many years and his loss will be felt by the many friends he made. He was born in Norfolk, Va., on Jan. 10, 1874, and was educated at Williams College. He began his business career in the hardware field in Hartford, Conn., but later became interested in the electrical industry through the Perkins Electric Switch Company of Brdgeport, with which he was connected. A few years ago Mr. Camp and the late C. I. Hills purchased the lamp-manufacturing business of the Perkins company and formed the Franklin Electric Manufacturing Company, Mr. Hills acting as president and Mr. Camp as treasurer and general manager. After Mr. Hills' death Mr. Camp became president and held this office until his death. Mr. Camp was a member of the Hartford Club, the Hartford Golf Club, the Farmington Country Club and the Engineers' Club of New York.

Mathias Klein, founder of the well-known firm of tool manufacturers bearing his name, died on Sept. 28, at the age of ninety-two. In his decease the industry loses a pioneer in the development of tools for the lineman and electrical mechanic. Mr. Klein saw his idea grow from a humble beginning as a blacksmith shop in 1857 to one of the largest tool-manufacturing plants of its kind. Mr. Klein retired from business only three years ago, at which time he was succeeded by his sons.

MATHIAS KLEIN

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

IRON CONDUIT STOCKS STEADILY GETTING SHORTER

Manufacturers Unable to Ship Except on Orders of Priority Rating A or Better—Few Jobbers Have Full Supply

Electric supply jobbers are beginning now to realize how serious the iron and steel situation really is. Particularly is this true when the supply of iron conduit is considered.

Producers of iron conduit, so far as can be learned, are not and have not for some time been shipping conduit to jobbers under their B-4 priority classification. All that a jobber can get is for orders of A rating or better. As to replacing stock utilized for shipments of A orders there appears to be a misunderstanding. Some manufacturers refuse to replace any stock, while other manufacturers are more liberal, taking the stand that stocks used for A rating shipments can be replaced provided it is pledged that they will be used to fill only those orders having an A or AA rating. Generally speaking, all of the manufacturers are living up to the pledges, but already there are unconfirmed rumors abroad that certain jobbers have been able to get conduit for stock.

Occasionally a jobber is found with a rather full supply of conduit, but this is very rare. In every industrial section it will be found that stocks of conduit are very low and becoming much shorter. Some houses already are out of material and within a very short time there will virtually be no available stock of conduit in the country.

Mills are working to capacity turning out pipe, but they are hardly able to meet the essential demand. A couple of weeks ago one producer was within ten days of shipping to jobbers for stock on their B-4 rating, but now this same concern cannot come within five weeks of making such shipments.

The production of pipe for oil lines is reducing the October output of standard pipe used for electrical purposes. The November output is expected to be still lower.

SUPPLY OF APPLIANCES HAS BECOME VERY SHORT

Already Some Manufacturers Are Beginning to Apportion Shipments to Their Customers on a Pro Rata Basis

Conditions in the electric appliance market have been fast approaching a critical stage for some weeks. Now the market is generally speaking quite bare. Here and there a few sizable stocks of flatirons, vacuum cleaners and washing machines can be found. The demand which accompanied the shortage of domestic help has grown to large proportions, and the manufacturers have not been able fully to meet it, let alone laying by a reserve stock to use for emergencies such as now exist.

In fact, orders placed as long ago as late last spring have not been filled, and now that the War Industries Board has pointed out the necessity for curtailment it is pretty certain that the trade will not receive all of the appliances ordered. In fact, some manufacturers are already allowing their customers only a prorated supply.

The principal shortages occur in 6-lb. flatirons, heaters, vacuum cleaners and washing machines. The supply of toasters, it is understood, is better than of these other articles. Flatirons have been short for some time. Four weeks ago it was impossible in the East to get a large immediate shipment of one of the more popular makes. About the same time one of the large producers had to call upon an Eastern jobber, who it so happened had anticipated conditions and stocked up heavily, to help him out of a serious predicament by releasing to him some of his stock.

The supply of heaters was very moderately fair at the end of the summer. At the first signs of cold weather these stocks were quckly cleaned out, and now heaters are very scarce. The landlords in the large cities have withheld heat much longer than normally, and with the influenza epidemic the demand for heaters was consequently greatly increased.

Vacuum-cleaner and washing-machine stocks are not so much shorter than they have been, nor will the curtailment orders of the War Industries Board make the situation any better.

PREPARATIONS MADE FOR COMING EXPORT TRADE

Combination of Small Electrical Companies Making Each a Separate Line Is Urged in England

Combinations for export trade are no new idea. German interests know how well this plan has succeeded, and English manufacturers have taken certain steps in this direction. Only recently it was proposed by the president of the British Institution of Electrical Engineers that the small firms, each making a different line of goods, should so unite.

Essentially the Webb bill was drawn up for this very purpose. Small manufacturers could not afford to develop foreign markets. They could not individually stand the sales expense nor the expense of collecting the account. On the other hand, a manufacturer of wire—say—another of lamps, one of motors, one of wiring supplies, etc., until a fairly complete line should be represented, could put a selling organization in the foreign field and by dividing the expenses make it possible for each to share in the export trade.

So far as is known, however, no such combination has developed in the electrical industry. Many small manufacturers, it is known, are anxious to sell abroad as soon as the war is over. They, of course, may do so through export houses, but in such cases business is taken as it comes and not developed for any particular domestic manufacturer.

With peace proposals being received from our enemies, it becomes apparent that this war is not going to drag on indefinitely, but that a victorious peace is not so far distant that the American manufacturer can longer postpone making definite preparations for stimulating export trade. Some things, of course, are being done, but for the most part they are being done very secretly for fear that American competitors will find them out. New electrical devices are being produced for the South American trade, but they are shown only in the greatest secrecy. However, there is apparently by no means so much interest in the development of foreign trade being taken in the United States as there in Europe. The signing of peace may find this country as unprepared for the world's trade as it was for the world's war.

EFFECT OF STILL FURTHER BUILDING CURTAILMENT

Latest War Board Ruling Should Lessen Demand on Stocks Already Low, but Will Prove Unfortunate to Contracting Interests

That no theaters, schools, hotels, hospitals or churches may be built in New York City during the war is the latest order from the War Industries Board affecting building. Furthermore, operations on buildings partly completed must cease at once unless they are so nearly completed that only the finishing material is needed. In such case they may continue if a permit is obtained. Pending further action of the War Industries Board, the manufacturers and distributers of and dealers in building materials may continue to furnish such materials to buildings substantially completed and to builders who have materials on the ground of operation.

Coming close after the recent non-war-building order of the War Industries Board, this ruling reduces building almost to the irreducible minimum. The electrical industry will be affected in some ways favorably and in others perhaps disastrously. It will mean another reduction of demand on jobbers' stocks for certain items that are already very low. This is particularly true in the case of conduit and wire.

Contractors and fixture dealers will probably feel this latest ruling most acutely. The former have for some time had but little to do, and now this little is lessened. The latter will not be so hard hit as if this action had occurred a year ago. The several housing projects and the business of fitting out new merchant ships have proved a great boon to this trade.

METAL MARKET SITUATION

Exports of Brass and Copper Decrease—Further Reduction in the Price of Tin

Business last week continued quiet, but there is evidence that, in spite of the heavy demand for war purposes at home and abroad, the output of copper will be sufficient to meet all essential requirements. There is every prospect that the output of both refined and crude copper this year will break all records. Nothing has happened to indicate that there will be any important change in the price of copper for shipment after Nov. 1.

Tin has been reduced in the London market again to £334 for standard prompt and future, and £334 10s. for Straits.

Some importers have received notice that the applications for permits which they had made and which they confidently expected to be granted promptly for a large quantity of tin for October and November shipments have been refused. This is chiefly for Straits tin for shipment from Singapore.

NEW YORK METAL MARKET PRICES

	Oct. 15	Oct. 22
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	28.75	28.75
Lead, trust price	8.05	8.05
Antimony	13.62½	13.37½
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	15.00	15.00
Spelter, spot	9.00	9.20
Tin, Chinese *	No quotations	No quotations
Aluminum, 98 to 99 per cent	Govt. price †33.10	Govt. price †33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	23.50 to 24.00	23.00 to 23.50
Brass, heavy	14.00 to 14.25	13.50 to 14.00
Brass, light	11.50 to 12.00	11.00 to 11.25
Lead, heavy	7.50 to 8.00	7.50 to 7.75
Zinc, old scrap	6.00 to 6.25	6.00 to 6.25

* No Straits offering. † In 50-ton lots or more; carload, 33.10 cents per lb. 0-ton to 14-ton lots, 33.20 cents per lb.

THE WEEK IN TRADE

SHORTAGES in stocks, particularly in conduit, small wire and domestic appliances, seem to be prevalent everywhere. Demand, however, has apparently showed no let-up. Suppliers, of course, are not able to handle all of the business that comes to them—some of it is not essential, some essential but not sufficiently so, and in other cases there is no stock. The latter is especially true with flatirons and radiators. Prices continue to show almost no changes. This condition has been going on now for four or five weeks.

Influenza is exacting its toll from the industry throughout the country in lives and loss of time and of production. In the East the epidemic is pretty well checked.

NEW YORK

No slackening of business was noticeable last week, although the latter part of it was almost wholly given up by business men to putting the Liberty loan through.

On Oct. 17 the Priorities Division of the War Industries Board announced the curtailment of production of electric fans to 40 per cent of 1917 and of electric vacuum cleaners to 75 per cent of six months of the 1917 output.

The situation in domestic appliances is still abnormal. The local market is virtually bare of stocks, and already there are indications of a prorated supply in the future, the most optimistic report being that not more than 70 per cent of the orders on hand could be filled.

According to the latest reports the influenza epidemic seems to have reached its height in the East and is now decreasing.

On Oct. 19 the War Industries Board announced that all new construction in building must stop until after the war. No theater, school, hotel, hospital or church will be allowed to be built in New York during the war or until further notice from the board. Operations on buildings partly completed must cease at once, but those structures so near completion that only finishing material is needed may continue, provided a permit is obtained. In addition, operations on buildings substantially completed and with builders who have materials on the ground may continue.

INSULATORS.—The demand for high-tension insulators has been good, and manufacturers' supplies on hand are in fair volume. Shipments are prompt. Low-tension glass-insulator stocks, owing to the general shortage of glass, are fairly low, but shipments are still going forward on time. Prices have not changed in the last two months.

MOTORS.—Motors of all types, both large and small, are in great demand and stocks on hand are low. The Emerson Electric Manufacturing Company on Oct. 5 advanced prices slightly more than 10 per cent on all types of motors 2 hp. and smaller, including motor applications, such as blowers, lathes and exhausters. Motor-generator sets were not advanced.

RADIATORS.—The shortage of stocks with all manufacturers of heating appliances is very acute, and the market is bare of supplies on hand. Orders on hand are very large, and one of the largest manufacturers has been obliged to supply his customers pro rata. Prices to date have not changed.

WIRE AND CABLE.—The requirements of the government for rubber-covered wire have increased so rapidly in volume that the manufacturers are rushed to capacity. At present there is an acute shortage in the market of all sizes under No. 6. Double-braid solid and stranded wires in gages No. 8 and smaller, as soon as the small stocks on hand are exhausted, cannot be furnished except with a

single-braid protection. The same situation applies to twin and duplex wires in solid and stranded form. One of the largest manufacturers will advance prices about 6 per cent this month.

VACUUM CLEANERS.—The popular demand for vacuum cleaners is still far ahead of the supplies on hand. One large manufacturer reports that he has 33⅓ per cent more orders on his books than he can fill and deliveries cannot be made until January. Prices have not changed.

CONDUIT.—The situation in this market remains the same. Steel mills are rolling pipe of all sizes to the limits of their capacity, but very little of it finds its way into the local market. Stocks on hand are spotty and getting shorter, and all shipments are confined to Class A and AA priority.

LAMPS.—Although the demand for lamps has been phenomenal, it is still increasing and makers are rushed to capacity to fill their orders. Supplies on hand are fair.

METERS.—One large manufacturer reports that foreign demand is brisk and increasing. Japan and China are large buyers. Prices in this line advanced about 10 per cent on Oct. 6.

TRANSFORMERS.—The demand still continues brisk with no accumulation of stocks on hand. Prices remain unchanged. One of the largest manufacturers has virtually discontinued making toy transformers, the reason given being that the demand had greatly decreased.

CHRISTMAS-TREE OUTFITS.—Manufacturers are reported to be loaded up with stocks. As yet no appreciable demand for them has developed.

CHICAGO

As far as activity in demand is concerned every week is a good week now. The situation has simmered down to one which is clearly understood as a struggle for material to supply the demand. The jobbers appear to be getting just about enough stock to get their customers by.

The big features of the week of course have been the Liberty loan and the talk about an early peace. Apparently the urgent necessity of closing up the Liberty loan successfully last week occupied the time of the entire trade. The talk of an early peace has had no effect on business as yet.

News of large industrial activities related to the war continues to come in. A commission of army officers has been sent to Chicago by the Secretary of War to investigate and report on a hospital project in Maywood, a suburb of Chicago. A contract involving $700,000 to $800,000 for the construction of 100 industrial houses for employees of the Corn Products Refining Company has been let to O. F. Giesecke & Company, Eastern contractors. The Wells Brothers Construction Company has the general contract for building 174 industrial homes in Hammond, Ind., at a cost of around $600,000 for employees of the Standard Steel Car Company. Rumors concerning the location in Chicago of additional aircraft work continue to be heard frequently.

The labor situation seems to be entering a new phase. The wage earners appear to be more quiet. Salaried employees, on the other hand, are showing evidence of a restless state which was not in evidence when the lower-priced labor was most active in its disturbances. The only class of men who seem to be in supply are men who were formerly devoting their entire effort to specialty sales. Curtailment of production along this line has driven them to market their services elsewhere.

Retailers report that the appliance trade in Chicago is all that could be expected. Jobbers report that there have at times been as many as 10 per cent of their employees away from work on account of the influenza epidemic. The peak of the epidemic appears to have passed, however.

ELECTRIC RADIATORS.—Jobbers report that there are no electric radiators to be had for immediate shipment out of their stock. They have on file back orders for several hundred radiators and are receiving radiators from the factories in lots of fifty at a time. This situation does not indicate any immediate opportunity for catching up. Relief is expected, however, owing to the fact that certain new lines of radiators were expected to come into the market on Oct. 15. The supplies have not yet been received from these manufacturers.

ELECTRIC RANGES.—Some electric range salesmen have been taken off the road temporarily.

SCHEDULE MATERIAL.—Jobbers' stocks are extremely heavy, having been built up to a war-tme basis. This is one line from which the jobbers would expect to suffer if an early peace were declared.

MOTORS.—The Emerson Electric Manufacturing Company of St. Louis has announced that on Oct. 5 prices advanced on all types of Emerson motors of sizes 2 hp. and smaller. No advance was made in the existing prices of motor-generator sets.

BOSTON

The volume of business is still somewhat below that of last month, though sufficient to keep everybody active. Many unfilled orders are still in jobbers' current files. Appliance sales show some falling off on account of government restrictions of output. A temporary lull in war business inquiries is on. Collections are a little slow, due probably to absorption in the Liberty loan campaign and to curtailment of electrical forces from the influenza epidemic. Business conditions are assuming a more normal aspect this week in this district, with the reopening of theaters, soda fountains, bowling alleys, schools and many other establishments temporarily closed. The feeling is widespread that fundamental conditions in the electrical trade are sound, with a promising outlook for business in the reconstruction era. Stocks are being maintained with considerable difficulty, and in some lines jobbers are about exhausted. Prices are about the same, with upward tendencies here and there.

RADIATORS.—Jobbers' stocks are practically "shot to pieces," with the market extraordinary. Retailers are not yet entirely sold out, but their stocks are running low. Innumerable householders are buying electric radiators in preference to starting furnace fires at the usual time.

LUNDIN FAULT LOCATERS.—Sales are good, and recent orders include sets for the Watertown Arsenal, Victory shipbuilding plant at Squantum and Hog Island shipyard. The demand is based upon service records, especially in connection with the cutting down of interruptions due to line and cable troubles and maintenance of production in munitions and other war plants. Inquiries are being received from foreign countries as well as domestic sources. At present immediate shipments can be made from stock. Recently a price advance of $25 was established on these sets, making the present price $400.

WIRE AND CABLE.—New England is still very short of No. 14 wire. Rubber-covered wire is quoted on a 34-cent base. There is some accumulation of local stocks of larger-sized wire at present. House-wiring work is very quiet.

STORAGE BATTERIES.—All types are running short, though here and there an exceptional stock can be found. Prices are steady. Government and transportation requirements dominate the field.

DRY CELLS.—Stocks continue low, with no immediate prospect of better conditions. No price changes are noted.

METALLIC FLEXIBLE CONDUIT.—The market is unsettled and some complaint is heard that manufacturers are not holding the jobbers' prices.

STARTING AND LIGHTING SETS.—Stocks of repair parts are running low. In some cases only about 20 per cent of the requirements are being shipped in at any one time. The curtailment of new pleasure-car building for next year will cut down this business materially.

MOTORS.—Stocks are increasing, certainly up to 50-hp or 75-hp. rating.

LAMPS.—Better stocks are reported with steady prices and a stronger demand.

ATLANTA

Jobbers report a continued heavy demand for all classes of electrcal material and supplies, which they are endeavoring to take care of from available stocks. The call for equipment from shipyards and military camps dominates the market, however, and comparatively little material is finding its way to ordinary commercial channels. A large volume of business is beng transacted in schedule material mostly for government account.

The recent ruling of the War Industries Board curtailing the manufacture of heating devices will, no doubt, affect retail sales to some extent, but the shipment on electrical devices has been so poor of late that there will be little difficulty in absorbing the new edict. The scarcity of workmen is still pronounced. This holds true at shipyards and the picric-acid plant at Brunswick, Ga.

The protracted drought over the Southeast is becoming more serious every day, and the power companies have inaugurated further curtailment of electrical energy. In order that the curtailment of all illumination may be uniform, the local fuel administrator's rulings apply to all classes of illuminants, such as electricity, gas, oil, and candles. The Georgia Railroad Commission has received several new applications for rate increases, includng one from Rome, Ga.

The deficiency appropriation bill reported to the Lower House contains an item covering about $1,000,000 for extensions to the Federal Prison, Atlanta, Ga. Additional government construction is contemplated at Pensacola, Fla., for barracks; at Fort McPherson, Atlanta, for hospitals; at New Orleans, for office building, yard and docks, and at Charleston, S. C., for 400 dwellings to accommodate navy yard employees.

HEATERS.—There is a good market for all available stocks. The headlight type is very popular and shipments so far have been good.

AUTOMOBILE ACCESSORIES.—The demand exceeds any visible supply. This equipment is hard to get. Spot lights are going fast; 36-cp. miniature lamps are not obtainable.

RECTIFIERS.—Jobbers are getting rid of these as fast as they come in. Shipments are not so good

FLATIRONS.—Outlying districts report that stocks are low and it is almost impossible to replace them in certain lines. One manufacturer, however, seems to have no difficulty in supplying his customers.

SEATTLE—PORTLAND

Business in the two largest Northwest cities continues very active, with nothing especially big in the way of sales noted. The volume to shipyards and allied industrials engaged solely in essential war work showed a slight increase over the past two weeks. However, this did not cause comment as volume necessarily fluctuates more or less as orders for ships are placed and as construction of vessels on the ways progresses. Retailers report sales volumes a shade heavier on domestic appliance lines.

The approach of winter is speeding up the sale of sockct devices, heaters, reading lamps, shades, etc. Washing machines as usual are leading in sales. Movement in washing machines, however, has been retarded on account of short stocks and slow deliveries. The demand for house-wiring devices is unprecedented in the history of the Northwest. Lamp supplies in smaller sizes are in fair shape, but the shortage in the larger sizes, particularly in the Seattle district, has never been overcome. Demand for larger sizes comes from shipyards and industrial plants, and they have resorted to substitution when demands could not be met. The shortage in rubber-covered wire, motors and conduit is acute, but no worse than heretofore reported.

Portland territory reports about the normal run of orders for the past week. There were no marked fluctuations in movement of merchandise in any particular line. Electric welding is gaining very rapidly in popularity, and within the last few weeks several welding outfits have been ordered and installed. The popularity of electric welding over gas welding is due partly to scarcity of oxygen and acetylene gases and also to the superiority of the electric process for many kinds of work.

The Dominion government has awarded British Columbia shipyards contracts for ten steel ships valued at approxmately $20,000,000. J. Coughlan & Son, Vancouver, will build four; the Wallace Shipyards, Vancouver, four, and the Victoria Machinery Company, Victoria, two. Orders for 100,000,000 ft. of lumber for military car material for the United States government to be distributed immediately among fir manufacturers of Oregon and Washington have been received. Seven thousand men are needed at once in Seattle's war industries, and 14,000 will be required before Dec. 1.

SAN FRANCISCO

The feature of the past week has been the number of power projects either projected or in course of construction that have been actively called to the trade's attention. These comprise several tying-in systems that will bring power from Oregon to San Francisco Bay, besides the building of certain dams and the raising of others on the systems of the Pacific Gas & Electric Company, the Great Western and the Sierra & San Francisco Power Companies. The lightless nights order for California has been curtailed from five to two. Gold dredgers are again operating after sixty days' restrictions.

The Vallejo Electric Power Company will extensively enlarge its plant to take care of the industries around Mare Island. Besides the increased industrial housing, unconditional work is being performed on the concrete shipbuilding plant in Oakland. On the other hand, it is reported that the Liberty Shipbuilding Company operations in the same locality have been discontinued and that the Parr-McCormack company's activities will extend to the repair of ships instead of building them.

Contractors' business is reported light. Orders are in small quantities on account of the patriotic pledges signed by the contractors, but a great increase in the sale of devices is noticed.

SCHEDULE MATERIAL.—Coast jobbers are now refusng to sell standard items such as push switches, ½-in. cap sockets and No. 14 rubber-covered wire in smaller than carton or coil lots.

RADIATORS.—With several makes in the market and the government recommending such devices for saving coal, a good season is assured. All companies are away behind on their orders. A local producer is requiring at least two months for completion of jobbers' stock orders, and the Eastern factories are having similar trouble.

MOTORS.—Unexpected early rains have killed most of the projects requiring motors from 100 hp. to 250 hp. for irrigation. Several sales of 250-hp. motors to the shipbuilding yards are reported for their fire pumps. The deliveries of smaller motors are a little better, but as essential permits are required a great deal of business is going to motor-repair plants.

HEATING DEVICES.—The flatiron market is quiet because of big stock orders placed by dealers prior to the recent advance. Few ranges are being sold. Prior to the recent influenza quarantine orders some big spare unit orders were placed by government yards and plants that expected to be subjected to quarantine regulations.

SWITCHES.—The number of externally operated steel-clad switches sold in the Pacific Coast district is estimated to have tripled during the past two years. This is mainly due to state rules, although the state rules require in addition to external operation the factor of a no-voltage-release to insure safety in operating machinery. State inspection has not yet been rigid. New switchboards for industrial factories present a very novel appearance owing to the new style of switches.

PORCELAIN MATERIAL.—Three hundred and fifty industrial cottages at Bay Point will be wired throughout with knobs and tubes.

FARM-LIGHTING PLANTS.—These are being actively solicited, and salesmen report awakened interest.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

Twin-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+20% to $73.20
Coil to 1000 ft	List
	No. 12 Solid
Less than coil	+20% to $85.20
Coil to 1000 ft	List

Twin-Conductor

	No. 14 Solid
Less than coil	$115.00
Coil to 1000 ft	100.00
	No. 12 Solid
Less than coil	+20% to $162.00
Coil to 1000 ft	List

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 12%
1/5 to std. pkg	+5% to 20%
Std. pkg	18% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
2 to 50	.40	.40— .41
50 to barrel	.35— .36	.35— .37
Barrel lots	.32— .329	.33— .329

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40 to $0.45	$0.40 to $0.45
12 to 50	.35 to .39	.35 to .39
50 to barrel	.319 to .362	.329 to .382
Barrel lots	.289 to .332	.299 to .342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
¾	100	13.00
1	50	13.00
1¼	50	21.00
1½	50	26.00
2	25–50	35.00
2½	25–50	45.00
3	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
⅜-in. single trip	$75.00	$63.75— 69.75
⅜-in. double strip	75.00— 82.50	72.00— 75.00
½-in. single strip	100.00	85.00— 93.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75 to $64.25
⅜-in. double strip	78.25 to $90.00	71.25 to 75.00
½-in. single strip	100.00	75.00 to 85.00
½-in. double strip	105.00 to 120.00	93.00 to 100.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
7/32	$0.05½	1	$0.25
½	.06	1¼	.33
⅝	.09	1½	.40
¾	.12	1¾	.47
⅞	.15	2	.55
1	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$25.00–51.70	$24.00–35.20	$23.00–30.25
½-in.—	30.00–56.40	28.00–38.40	26.00–33.00

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$44.00–60.00	$30.00–33.00	$26.50–29.15
½-in.—	48.00–65.00	33.50–37.50	29.00–31.80

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
⅛	$0.08½
¼	.08½
⅜	.08½
½	.11½
¾	.17
1	.23
1¼	.27½
1½	.37½
2	.58½
2½	.76½
3	

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
⅛	$0.05	$0.19
¼	.06	.19
⅜	.07	.19
½	.10	.25
¾	.13	.37
1	.17	.45
1¼	.21	.50
1½	.28	1.10
2	.40	1.80
2½	.60	4.80

DISCOUNT—NEW YORK

	⅛ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb	7% to 7.1%	9% to 9.1%
2500 to 5000 lb	10% to 10.1%	12% to 12.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	⅛ to ½ In.	¾ to 3 In.
Less than 2500 lb	+3.5% to 5.5%	+1.5% to 3.5%
2500 to 5000 lb	+2.5% to +5%	+5% to 1.5%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$6.00 to $7.00
Discount	20% to 30%

CHICAGO

List price	$6.00 to $7.00
Discount	20% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp	100	$0.25
35-amp. to 60-amp	100	.35
65-amp. to 100-amp	50	.90
110-amp. to 200-amp	25	2.00
225-amp. to 400-amp	25	3.60
450-amp. to 600-amp	10	5.50
600-Volt		
3-amp. to 30-amp	100	$0.40
35-amp. to 60-amp	100	.60
65-amp. to 100-amp	50	1.50
110-amp. to 200-amp	25	2.50
225-amp. to 400-amp	25	5.50
450-amp. to 600-amp	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41% to 45%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30% to 31%
1/5 to std. pkg	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$6.00 to $9.30
1/5 to std. pkg	5.25 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$8.00
1/5 to std. pkg	7.00

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg.	List
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	List
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.47—$40.77
Coil to 1000 ft.	27.42— 30.22

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$38.00
Coil to 1000 ft.	28.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$21.75 to $30.00

OUTLET BOXES

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%	20%
$10.00 to $50.00 list	36%	31%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	20%	10%
$10.00 to $50.00 list	30%	20%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	5%
1/5 to std. pkg.	15%
Std. pkg.	25%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$21.00 to $34.00
1/5 to std. pkg.	17.85 to 28.90

Standard package, 2200. List per 1000, $21 to $34

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$16.80–24.15
1/5 to std. pkg.	15.80–21.00

Standard package, 2200. List per 1000, $20.00–21.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$16.00 to $22.00	$32.00
1/5 to std. pkg.	13.60 to 18.70	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$11.70–$24.00	$33.85–$36.80
1/5 to std. pkg.	10.15– 20.00	26.60– 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	List
1/5 std. pkg.	10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	$0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15% to +10%
$10 to $25 list	2% to 5%
$25 to $50 list	5% to 10%
	Low Grade
Less than $10 list	+5% to list
$10 to $25 list	8% to 15%
$15 to $50 list	15% to 20%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+ 15%
$10 to $25 list	List to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	8%
$25 to $50 list	15% to 16%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List
Std. pkg.	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+30% to 10%
1/5 to std. pkg.	+5% to 16⅔%
Std. pkg.	18% to 25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 30%	Net to 30%
$2.00 to $10.00 list	10% to 35%	5% to 40%
$10.00 to $50.00 list	20% to 37%	10% to 52%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 50%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00 to 6.50
Discount	20% to 30%

CHICAGO

List price	$6.00 to $6.50
Discount	20% to 30%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.51–$0.66
No. 18, full spools	.49– .56

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.72
No. 18, full spools	.55 to .605

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$20.00–$25.00	$15.00–$17.00	$15.00
12	23.58– 27.09	21.62– 29.09	$17.68– 23.22
10	30.20– 37.80	27.45– 32.40	23.47– 32.40
8	42.74– 53.34	38.85– 45.72	33.21– 45.72
6	61.50– 84.42	55.35– 72.36	52.58– 55.48

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$25.00	$18.00	$15.50
12	$29.46– 31.44	$29.46– 31.44	$25.54– 31.44
10	41.10– 43.84	41.10– 43.84	34.62– 38.36
8	57.00– 61.76	57.90– 61.76	50.18– 54.04
6	85.31– 97.68	85.31– 85.47	72.21– 85.47

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$39.75 to $44.00
25 to 50 lb	39.75 to 42.00
50 to 100 lb	38.75 to 40.00

CHICAGO

	Per 100 Lb. Net
Less than 25 lb	$41.00 to $41.76
25 to 50 lb	39.75 to 40.76
50 to 100 lb	38.75 to 39.76

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Stove with Exchangeable Heating Unit

Ease and quickness in repairing are facilitated by the readily exchangeable heating unit featured in the No. 103 stove recently brought out by the

EXCHANGEABLE HEATING ELEMENT FACILITATES REPAIRS

Redtop Electric Company, 8 West Nineteenth Street, New York City. It is pointed out by the manufacturer that where stoves are used on farms and homes distant from electric repair shops the exchangeable heating unit makes it possible for the user himself to do the repairing.

The stove is of polished nickel plate, has a steel top and two handles, is wound for voltages ranging from 32 to 240, either alternating or direct, and requires 600 watts.

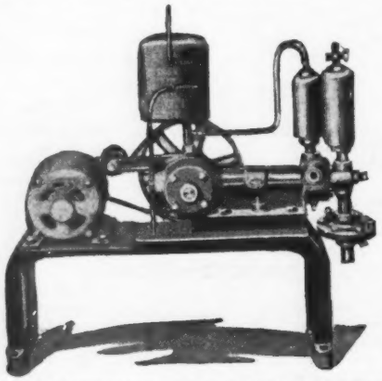
Ozone Water Purifier

For use in homes, offices, drug stores, restaurants, hospitals and the like, the Ozone Company of America, Milwaukee, Wis., has designed a convenient size of ozone water purifier. The manufacturer says that in the ozonizing process employed ozone is produced by means of an electric current and mixed thoroughly with the water as drawn from the faucet. It is also held that the extra oxygen atoms of the ozone combine with organic matter of the germs in the water and burn them up, the carbon dioxide formed by this chemical action passing out into the air and leaving a trace of the same effect produced in carbonated beverages. This adds to the palatability of the ozonized water. It is claimed that all tastes and odors are removed by this process, while mineral elements essential to health remain, since they do not oxidize.

Water supplies are frequently chlorinated, and it is claimed that this ozone water purifier will eliminate the odor and taste of chlorine from the water in the same way as it eliminates other objectionable odors and tastes. It also is stated that each of the water purifiers has a producing capacity of over 2000 gal. a day; therefore any user is entirely independent of the condition of the water at the municipal plant in his city. This company also is in position to furnish industrial and municipal installations ranging from 100 gal. up.

Electric Suction Pumps

Suitable for individual water supply systems and for a large variety of special purposes, Paul suction pumps, manufactured by the Fort Wayne (Ind.) Engineering & Manufacturing Company, are said to be exceptionally strong, are easily accessible and are convenient to handle. This pump was designed especially to supersede the water motor-driven pump, and it is claimed that it does away with all the troubles connected therewith and practically eliminates care and repair. Noiseless in action, small in size, simple, strong and self-contained, it fills the requirements for residence service in an ideal manner, according to the

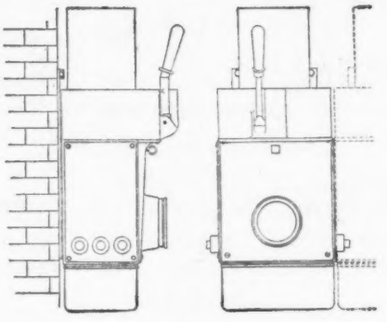


AUTOMATICALLY KEEPS WATER PRESSURE CONSTANT

makers. The pump is driven by a special belt from an electric motor of ½ hp. mounted on the bed plate. The belt is tightened by a spring-loaded idler with oilless bushing. The pump is of the plunger type, fully brass-fitted, bolted to the frame so that it overhangs the bed, and giving free access to all pipe connections. On the bed plate between the pump and the motor is an automatic electric controller connected to the pump by a small copper tube and wired to the motor, starting the pump automatically when the pressure has dropped to the lowest point and stopping the pump when the pressure has reached the highest point for which the controller is set, thus keeping a constant supply of water under pressure.

"Safety First" Wall-Type Switching Unit

The wall-type switching unit shown herewith is intended for the control of alternating-current circuits up to 300 amp. and 2500 volts. The unit consists of an industrial-type oil circuit breaker with a space above which



NEAT AND COMPACT SWITCHING APPARATUS

serves as a housing for disconnecting switch, current and potential transformers and also provides a location for either voltmeter or ammeter, or both when desirable.

Following safety-first principles, the disconnecting switch is interlocked, mechanically, with the oil circuit breaker so that the switch cannot be opened when the breaker is closed, nor can the breaker be closed while the disconnecting switch is open. A key projecting through the front of the panel is used to operate the switch. This key can be removed when the switch is open and carried by the operator with the assurance that no one can close the switch while he is working on lines or apparatus on the circuit controlled by this unit. The interior of the switch compartment is also inaccessible while the switch is closed, and the oil tank cannot be removed while the disconnecting switch or oil circuit breaker is alive.

These switching units are made for use with the control of circuits feeding banks of transformers, motors in steel mills and pumping plants where it is desirable to mount the motor-control appliances on walls or pillars. They are designed for single or group mount-

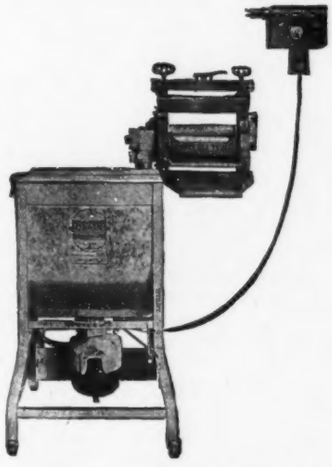
ing and have a large bus compartment just above the disconnecting switch and inside the cast-iron housing. This switching unit is made by the General Electric Company, Schenectady, N. Y.

Luminous Attachment for Pull-Chain Lamp Sockets

An adaptation of the self-luminous substance used on the hands and figures of their watches is being marketed by Robert H. Ingersoll & Brother, 315 Fourth Avenue, New York City, for attachment to the pull chains of lamp sockets. The lamp is thus readily found in a dark room. The "Ingersoll Lite," as the device is called, consists of a small unbreakable glass filled with the luminous substance. A brass cap completes the attachment, which can easily be placed on the chain without the use of tools.

Laundry Fittings

The Appleton Electric Company of Chicago has designed a laundry fitting for use in apartment houses which is so arranged that each tenant will have available a branch circuit from his meter for the purpose of using electric washing machines and ironers. The outlet on this circuit is kept locked while not in use to prevent theft of electricity. This fitting is made in single, two-gang and three-gang styles and is provided with one, two or three locked hinged doors, so that each tenant holds a key to his particular outlet. Where there are more than three tenants in a building, as many gang boxes as necessary are installed. The manner of installing a three-gang fitting and connecting it to a washer is shown in the accompanying illustration.



AFFORDS INDIVIDUAL OUTLET ON WASH DAY

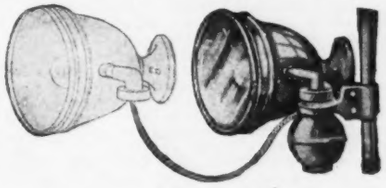
The gang-fittings are furnished with partitions forming separate compartments. The back of each compartment is drilled and tapped for the supporting screws of the receptacle for receiving the attachment plugs of a washer or iron.

Reflectors for Showcases

Designed for glass or wood-frame showcases, special reflectors are being made by C. W. Cole & Company, Los Angeles, Cal. These reflectors, which are made to the measurements of showcases, consist of three parts, the reflector itself, a triangular channel for the upper corner of the showcase and a clip that passes through the channel and reflector and through the felt and cement separating the top and front plates of glass in the showcase. This clip serves to hold the triangular channel in its place in the reflector, and the channel in turn holds the reflector in proper position without the use of other visible support. The reflector, which is designed for use with 10-watt Mazda sign lamps, is made of one piece of heavy metal finished to match the case. The inside is finished in a flat-white sprayed celluloid.

Spot Light Useful for Night Repair Work

An automobile spot light has been placed on the market which combines an automatic extension feature whereby the lamp may be removed from its windshield brackets without altering or making any electrical connections and carried to a considerable distance from the car if desirable. Such a combination is made by the Anderson Electric Specialty Company, 118 South Clinton Street, Chicago. An adjustable cord reel is placed in the ball casing just back of the lamp. To use the lamp for portable purposes the knurled nut is unscrewed and the lamp withdrawn to the desired length. The cord reel operates like an ordinary curtain roller.



SPOT LIGHT MAY BE CARRIED TO A CONSIDERABLE DISTANCE FROM THE CAR

Although this spot light is designed more particularly for automobile repair work, it should evidently be very useful in connection with night repair work on electric lines and outdoor substations, giving the lineman a powerful and dependable source of illumination.

Charging Panels for Damp Locations

Where the battery-charging outfit is exposed to leaks in the roof or other sources of moisture it is important to protect the switchboard apparatus. This the Automatic Electrical Devices Company, Cincinnati, Ohio, accomplishes by roofing the panel as shown in the illustration. This particular panel is also designed for the minimum space requirement.

In addition to the usual equipment of switches and circuit breakers it is equipped with a chargometer and automatic underload switch which disconnects the batteries in case of failure of line voltage and recloses the circuit upon the restoration of the supply voltage. It is stated by the manufacturer that the charging operation is extremely simple, requiring only the setting of the chargometer for the desired length of charge and closing the switch.

COMPACT CHARGING PANEL PROTECTED FROM MOISTURE

The company makes a wide range of panels for charging Edison as well as lead batteries.

Portable Galvanometers with Rugged Suspension

The suspension type of portable galvanometer has been used for work requiring a high sensitivity, but care has been necessary because the instruments had to be accurately leveled, and if not handled carefully the suspensions would break.

The Model A portable galvanometers manufactured by Herman H. Sticht & Company, Park Row Building, New York City, have a new type of moving system which is said to be extremely rugged.

The single suspension has been replaced by top and bottom metallic suspensions, both being under tension. With this construction the instrument does not require leveling. Because of the special construction of the frame in which the moving system is mounted the maker says it is practically impossible to break the suspension. Means are provided for setting the pointer at the zero position, and the instrument is equipped with a device for damping the moving system during shipment which automatically operates when the cover is closed.

The instrument is mounted in a walnut case, 9 in. by 8 in. by 6 in. (23 cm. by 20 cm. by 15 cm.), with removable hinged cover. The scale is provided with mirror reflector and can be furnished with graduations of 100 or 150 divisions.

Trade Notes

QUARTERMASTER'S LIST OF BIDDERS.—A list of bidders on all articles purchased by the Quartermaster's Corps is being prepared. All manufacturers and business concerns that make application for a place on the list will be included, whether they have been doing or bidding for work for the department or not. Such applications should be made to the Purchase Records Branch, Supply Control Division, office of Quartermaster-General of the Army, Washington, D. C.

NEW QUARTERS OF ST. PAUL ELECTRIC COMPANY.—The St. Paul Electric Company, electric supply jobber of St. Paul, Minn., is sending to its customers a "Good-Will Book" in a spirit, says B. B. Downs, president of the company, of "appreciation and satisfaction—appreciation of the business you have intrusted to us and satisfaction in having supplied your needs for goods promptly." The occasion for this book is the opening, after nineteen years of business, of the concern's new home, a large and imposing five-story building. The book is devoted to its facilities for giving services in these new quarters.

HURLEY EMPLOYEES HOLD REGULAR DANCES.—In Hurley Hall, Chicago, which the Hurley Machine Company has provided for its employees, dances and card parties are held every two weeks. On a recent occasion the hall was beautifully decorated by the boys and girls of the company. Over 400 employees, including men and women from both the office and shop, were in attendance. The dance program included fifteen numbers. Honorary members of the "Hurley Thors" are N. C. Hurley, J. H. Sullivan, H. Dubla, R. J. Kellogg, A. J. Fisher and F. A. Allair. The reception committee comprises Chairman M. Garcis, May Zima, H. L. Osborne and W. Sheehan and the floor committee Chairman C. J. Ulrich, Francis Vodraska, George Geske and A. Johnson.

PITTSFIELD GENERAL ELECTRIC EMPLOYEES FIGHT INFLUENZA.—Vigorous coöperation in the campaign against the influenza epidemic was rendered by the Pittsfield (Mass.) Works of the General Electric Company last week. C. C. Chesney, general manager of the company, was recently made chairman of a citizens' advisory committee, of which Sidney W. Ashe of the company was also a member, in assisting the local board of health, the federal authorities and others in attacking the scourge. As the result of a conference, the city was sectionalized and the headquarters of one section was established at the Pittsfield plant of the company, with day and night telephone service. Two hundred employees of the works volunteered to act as nurses, and sixteen of these were promptly inducted into service.

PROVISION OF NEW WAR DEPARTMENT PURCHASE CONTRACTS.—The new standardized form of contract to be used by all purchasing agencies of the United States War Department contains the following provisions: Claims, doubts or disputes as to non-performance of contract which cannot be settled by agreement will be placed before the Secretary of War or his representatives for adjustment. Government retains right to terminate any contract in the public interest, and provision is made for equitable adjustment of expense incurred by contractor. In cases specified by law wages shall be computed on basic eight-hour day. Minors under fourteen shall not be employed, and minors between fourteen and sixteen not over eight hours per day or more than six days per week, or before 6 a. m. or after 7 p. m. Convict labor is prohibited, except by executive order. Contractor may appeal to Secretary of War for settlement of labor disputes that threaten to delay work and is obligated to comply with Secretary's adjustment. In case an increase of wages is ordered, contractor will be compensated, and if wages are reduced, price to government will be lowered. Government retains right of inspection of all cost elements in "cost-plus" contracts; proposed expenditure for labor and material must be approved in advance, and all such contracts are subject to review by the superior board of contract review. Fixed-price contracts will be used whenever possible. Contractor is obliged to provide protection for his plant against espionage, fire, explosion, acts of war and alien enemies. Contractor shall, when required, report alien status of any or all of his employees. Government retains right to prevent employment of suspected persons.

JAPANESE FOREIGN LAMP TRADE.—A party of Chinese business men and journalists recently visited, by special invitation, the electrical exhibition in Uyeno Park, Tokyo, Japan, where domestic electric appliances, lamps, electrochemical plant, wireless telegraph and telephone apparatus, etc., were exhibited. The opportunity afforded by the stoppage of German, British and American supplies of electrical machinery to China is being turned to good account by Japanese manufacturers. The latest figures available show that the exports of electric lamps and apparatus from Japan are already valued at nearly $4,000,000 per annum. In this connection, however, it must be kept in mind that American lamp manufacturers have seen the advantage of having lamp works in Japan manned with Japanese labor. It is quite probable, therefore, that a very considerable portion of this incandescent lamp trade of the East will return a profit to American manufacturers.

WESTERN ELECTRIC WAR ACTIVITY.—In explaining how the Western Electric Company had come to its war activity of between 90 and 100 per cent, H. A. Halligan, vice-president of the company, in a recent issue of the *Western Electric News* summarized the situation as follows: "1. The engineering department's time is now divided between the problems incident to the transmission of speech, broadly speaking—this for the benefit of the telephone industry, now under government control, and these problems as applied particularly to warfare. 2. The manufacturing departments are working 100 per cent on telephone and telegraph apparatus and cable for either the government itself or its controlled operating telephone and telegraph companies. 3. The distributing department warehouses and disburses the foregoing equipment exclusively to these two classes of customers, and in so far as the business of jobbing electrical supplies is concerned, it is required to limit such sales to industrial plants actually engaged in war work, to contractors installing electrical material in such establishments, or to public service corporations, coal mines, street railways or others enjoying a preferred classification as essential to the conduct of the war. Even among the few exceptions to the foregoing, we are selling equipment like sewing machines, heat regulators, washing machines, farm power and light plants and similar devices which because of their labor and fuel saving character are looked upon by the government as in the field of necessary manufacture, and up to now the raw material has been made available by government order."

ALLIS-CHALMERS WAR WORK.—Like other manufacturers in the industry, the Allis-Chalmers Manufacturing Company is largely engaged in war work, with the government its biggest customer. At the present time, however, this work is almost entirely made up of its normal products. What strictly war goods are going through the plant are very small. Only one item of the following table shows any strictly war goods, and that, the "Miscellaneous," has only a small portion of shells, etc. Thus the production of this plant, while going to help win the war, is nevertheless essentially of a peace nature. The official classification, showing eight months' "sales invoiced" and "orders booked," is reported as follows:

	Sales Invoiced Eight Months	Orders Booked Eight Months
Gas and oil engines	$522,244	$1,056,799
Steam engines	2,448,009	5,049,879
Forging	1,441,951	339,761
Electrical	7,608,518	7,746,404
Air brake	182,340	310,136
Hydraulic turbines	1,049,429	398,051
Centrifugal pumps	743,329	703,278
Flour-mill	755,368	1,069,972
Saw-mill	458,174	821,408
Steam turbines	1,848,761	1,676,143
Pumping engines	591,274	661,823
Mining machinery	1,480,511	2,110,818
Crushing and cement	1,865,513	1,421,992
Farm tractors	351,381	342,232
Miscellaneous	607,693	2,017,908
Total	$21,954,498	$25,723,608

In excess of $5,000,000 worth of orders, it is reported, were booked in August, which represents the maximum the management could see its way clear to accept under labor conditions and conditions governing the raw material market. It does not, by any means, represent the orders which might have been obtained if plant capacity were not limited. In August the output was invoiced at $3,000,000, which is $1,200,000 more than in January and $200,000 more than in July. It is the highest month's production so far attained. Unfilled orders totaled $30,856,361 on Aug. 31.

THE ANGOLA (IND.) ELECTRIC MANUFACTURING COMPANY, it is reported, has taken over the Sevison Electric Company of Elkhart, Ind., and also the Sevison Electric Repair Company. The new company manufactures the Sevison high-tension magneto, an all-metal switch which is used with the magneto, besides three designs of magneto coupling.

THE KOPPEL INDUSTRIAL CAR & EQUIPMENT COMPANY has been organized as a subsidiary of the Pressed Steel Car Company to take over the business of the Orenstein-Arthur Koppel Company, builders of electric industrial trucks and other equipment, Koppel, Pa. The plant was recently sold to the Pressed Steel Car Company by the Alien Property Custodian.

EDUCATING DISTRIBUTERS OF FARM-LIGHTING SETS.—Manufacturers of farm-lighting sets have for some time now been making strenuous efforts toward obtaining wider distribution. Various schemes have been tried, but one difficulty has been to get distributers who not only are salesmen, but who know the product they are handling. In order apparently to overcome such objection, there has recently been printed by the Lalley Electro-Lighting Corporation, Detroit, a comprehensive discourse in two sales manuals on how to sell farm-lighting sets. It has been the policy of this company to market its products exclusively to established distributers who are operating with the manufacturer under a contract by the terms of which the distributer is granted the sale of the company's products in a fixed territory. The two sales manuals which have just been put out are for the purpose of giving to all of the salesmen of the lighting sets information in simple and concrete form which should be the basis for the dealer's development of the agency into a real merchandising business which will be permanent and increasingly profitable. In addition, the information given in the manuals was designed to form the basis of a salesman's training in the field. The information appears to be very complete.

PLANS FOR AFTER-WAR TRADE.—The time is now ripe for more centralized, concerted work on a program of economic reconstruction after the war, says a report made public by the Bureau of Foreign and Domestic Commerce, Department of Commerce. It is the first of a series of reports to be issued on this subject and is devoted to the plans under consideration by other countries, especially as they bear on future foreign-trade developments. "The outstanding fact under observation," states the report, "is the recognition in every land and by all statesmen of the problem called 'economic reconstruction.' But of more immediate importance is the fact that England, France, Italy, Germany and Austria are making preparations to resume their peaceful economic life, with improved facilities for foreign trade, with a national supervision of the use of natural resources for the benefit of their own citizens, and with assistance from the state." Attention is called to the achievement of our own government in preparing for after-war conditions, such as the building and organization of a huge merchant navy backed by large and efficient shipyards and docks, the Webb-Pomerene export trade act authorizing exporters to combine for export trade, and the leeway in foreign-trade banking now possessed by the Federal Reserve Board and banking system. All told there has been a very considerable amount of effective work done looking toward the future, but much remains undone, and the bureau is issuing this analysis of European tendencies as a guide, although calling attention to the fact that each country has its own peculiar problem that it must work out for itself. "In England," says Mr. Cutler, chief of the bureau, in his introduction, "judging from present comments on the work of the committee on commercial and industrial policy after the war, any present attempt to lay down complete and binding policies regarding the future is now recognized as a waste of effort. What is more important is the assembling of facts, taking the basic step to improve our education, research and promotive organizations and contributing to clear thinking as to the questions involved. Sooner or later we must have a definite program in which work and plans for the future based on known conditions affecting our future may be coördinated. I personally feel that the time is now ripe for some more centralized, concerted work to that end." The report is entitled "Economic Reconstruction," Miscellaneous Series No. 73, and is on sale at 10 cents a copy by the Superintendent of Documents, Government Printing Office, Washington, D. C., and by all the district and coöperative offices of the Bureau of Foreign and Domestic Commerce.

THE AMERICAN NITROGEN PRODUCTS COMPANY has opened Eastern offices in the Woolworth Building, New York City.

C. D. MORTON has left his position as sales engineer for the Page Steel & Wire Company to become a captain in the General Engineer Depot, United States Army.

C. F. HENDERSON, Call Building, San Francisco, has been appointed representative of the Electric Controller & Manufacturing Company for the northern half of the State of California.

E. E. STRONG is leaving the employ of the New York State Railways, Rochester Lines, of which he was superintendent of transportation, to go into the electrical machinery and apparatus business with the Henry J. Shiefer Company, 312 E. & B. Building, Rochester, N. Y.

PAUL DRUMMOND, who was formerly connected with the Pittsburgh office of the Cutler-Hammer Company, has been appointed second lieutenant in the Twenty-ninth Engineers by General Pershing. Mr. Drummond has been in France for some time as a private.

R. F. IRVIN has been appointed as assistant to L. D. Calhoun, the advertising manager of the Square D Company of Detroit, manufacturer of Square D switches. The appointment became effective Oct. 3. Mr. Irvin was formerly branch advertising manager of the B. F. Goodrich Rubber Company, in charge of advertising for the Philadelphia territory.

H. M. NEWKIRK has been appointed mechanical engineer of the Hygrade Lamp Company, Salem, Mass., succeeding L. H. Pike, who recently became factory manager. Mr. Newkirk has been in the employ of the Hygrade company for three years. His first work was as head of the wire-drawing department, after which he was made a development engineer. His latest work has been the charge of shrinkage on mounts.

CHARLES E. GOODNOW, formerly assistant sales manager of the electrical and special wire department of the American Steel & Wire Company and more recently identified with building construction work in Washington and Brooklyn for the army and navy, is now with the Page Steel & Wire Company, 30 Church Street, New York. Mr. Goodnow's efforts will be devoted to sales and service on "Armco" iron welding rods and "Copperweld" electrical wire.

THE NATIONAL X-RAY REFLECTOR COMPANY, Chicago, has announced the following changes: O. F. Benjamin, sales engineer, is now in charge of the lighting department of Brown-White, Inc., resident engineers for X-ray products in the Philadelphia territory. J. E. Lauderdale of the engineering department is now service manager, taking the place of W. F. Martin, resigned. I. M. Kirlin, formerly resident engineer in Minneapolis, is now in the engineering department of the Chicago office.

THE LINEMEN PROTECTOR COMPANY, Detroit, has made an offer to lighting companies that have not purchased its full-line safety devices to furnish two Marshall's linesmen shields, listed at $45 each, and three Marshall's cross-arm shields, listed at $15 each, a total of $135 worth, for either a hundred-dollar Liberty bond or twenty five-dollar thrift stamps. This offer, which expires Nov. 1, is being made to help win the war in addition to allowing all lighting companies an opportunity to give a practical test to the company's full equipment of linemen protective devices.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, is on its way for the most prosperous year in its history. Recent reports are to the effect that manufacturing profits for the first six months of the current year were approximately $2,000,000, which compares with $2,220,613 for the whole of 1917 and $1,318,796 for the whole of 1916, the last-named year having been the best year the company had had up to that time. The figures are compiled before federal taxes have been provided for, for which $450,000 was set aside last year. Although the company is engaged largely on government contracts, it is on lines of production which the company has been accustomed to handle and which have not required plant extension or new equipment that will have to be scrapped after the war is over, as is the case with many companies. The plant enlargement accomplished a couple of years ago was to take care of the increase in the company's regular business, and there is reason to expect that this business will continue to be of large volume when peace comes.

W. C. ANDERSON has retired from the presidency of the Electric Car Company, Detroit, Mich., after more than thirty years of active service as president of that company and its predecessor, the Anderson Carriage Company. Mr. Anderson is succeeded as president by M. S. Towsen, who has been general manager of the company's plant in Cleveland. The other officers are: Vice-president and general manager, G. O. Fairgrieve; treasurer, W. M. Locke; secretary, W. P. McFarlane. The company's plants in Detroit and Cleveland have been enlarged and it is reported that provision has been made for increased production of Detroit electric passenger cars.

THE UNDERFEED STOKER COMPANY OF AMERICA, Chicago, is opening a number of new offices owing to its rapidly expanding business. A new district office has just been opened in Cleveland, at 604 Sweetland Building, in charge of H. F. Post, formerly connected with the home office. S. A. Williamson, until recently a member of the Cincinnati staff, has been chosen to take charge of a new office that is being established at Minneapolis. The address will be announced later. G. W. Bonnell, who formerly represented the company in the St. Louis territory, will shortly take charge of a new office being established at St. Louis. The address of this office has not yet been definitely decided upon.

THE EDISON ELECTRIC APPLIANCE COMPANY, INC., Chicago, as a result of the seriousness of the heater cord situation, because of the manufacturers of heater cord having had to utilize their machinery to a large extent for war purposes, has addressed to its customers a letter stating its position as follows: "At the present time we are experiencing great difficulty in getting cord in sufficient quantities to supply the demand. We suggest that you put forth every effort to conserve heater cord wherever possible. This could be accomplished by suggesting to your customers who want to purchase new cords for their appliances to have their old cord repaired if possible, and if the customer is buying two appliances where the cords and plugs are interchangable, suggest to them that they use one cord and plug for both appliances, and you can use the extra cord and plug for repair purposes. Therefore it has been necessary for us to limit our distribution of cords complete to six to any one customer. We can, however, supply plugs to which you can attach proper length of cord from your stock."

THE LEWIS-ROTH CORPORATION is now installed in its new building at Thirteenth and Wood Streets, Philadelphia. This company, which has had a rapid growth, was organized as the Lewis-Roth Company on July 1, 1910. The force, then consisting of the two partners, L. R. Lewis and R. T. Roth, and a stenographer, rapidly increased, and in October of that year the company had to move to larger quarters. In 1914 and 1915 it secured substantial contracts for installations for plants largely engaged in war work, including the Remington Arms Company, Baldwin Locomotive Works, Eddystone Ammunition Works and others. In May, 1916, the company opened a factory on the second floor at 824 Cherry Street, Philadelphia, to manufacture high-tension apparatus and switchboards. Business increased so rapidly that it was soon necessary to take additional space on the first floor and basement, and later the fourth floor of the same building was engaged. In June, 1918, the company was reorganized as the Lewis & Roth Corporation under the same management. The growth of the business is illustrated by the following figures showing the annual sales: 1912, $92,865.43; 1913, $118,716.99; 1914, $133,249.56; 1915, $203,774.97; 1916, $603,077.06; 1917, $675,243.62, and for four months of 1918, $345,908.09. Additional orders and contracts in hand at that date amounted to $890,899.47.

Trade Publications

SOLDERING IRONS AND SAFETY RACKS.—Two leaflets, publications 403 and 404, have been put out by the Cutler-Hammer Manufacturing Company, Milwaukee and New York. The first enumerates advantages of the company's automatic safety racks, which keep soldering irons at safe temperatures between periods of use, while the second points out the work requirements met by the Cutler-Hammer soldering iron.

SHADE HOLDERS.—Harvey Hubbell, Inc., Bridgeport, Conn., is distributing a two-color leaflet giving description and prices of the Hubbell shade holders.

PORTABLE GALVANOMETER.—Herman H. Sticht & Company, Park Row Building, New York City, are sending out a mailing card containing information regarding their Model A portable galvanometer which has rugged construction.

LINEMEN'S STRAPS AND BELTS.—Descriptions and illustrations of linemen's straps and belts, coupling rods, sewer or conduit screw rods, a cable reel jack and a shoving or trench jack are given in a recent circular of T. J. Cope, 1620 Chancellor Street, Philadelphia.

ELECTRIC STOVES.—A line of electric stoves, including one with an exchangeable heating element, is illustrated and described in a leaflet from the Redtop Electric Company, Inc., 8 West Nineteenth Street, New York City. A sterilizing and a combination cooking utensil are also included.

LAMP GUARDS AND SHADES.—With the title of "The United States Army and the Holdfast Army—An Interesting Comparison," W. N. Matthews and Brother of St. Louis, Mo., are distributing a circular giving interesting facts regarding the United States Army and the Matthews "Holdfast" lamp guards and shades.

VALVE CONTROL.—"Facts" is the title of the new eight-page booklet issued by the Cutler-Hammer Manufacturing Company of Milwaukee and New York. The Dean valve control and its applications to large valves are described and illustrated, with special emphasis on the prevention of bursting water mains through the strategic placing of these valve controls.

PHOTOGRAPHIC AND MOTION-PICTURE ARC LAMP.—Describing comprehensive changes in their arc lamps for motion-picture and photographic use, Allison & Hadaway, Inc., 42 West Thirty-ninth Street, New York City, have prepared a booklet on their "Panchroma" twin-arc lamp which is self-contained, light in weight and has a folding stand.

FUEL AND ASH CONTROLLING GATES.—To give descriptions, dimensions and illustrations of its standard gates for controlling the flow of granular materials from bunkers, the Beaumont Manufacturing Company, 315 Arch Street, Philadelphia has published its catalog 37, which also illustrates the design of ash pits under boilers and the correct gates to use for this purpose.

New Incorporations

THE ROCK RIVER VALLEY LIGHT & POWER COMPANY of Hillsdale, Ill., has been incorporated with a capital stock of $20,000 by Clarence D. Butzer, Frank L. Wake and Fred Frels.

THE ADRIANCE BATE STEAM FUEL ECONOMY CORPORATION of Brooklyn, N. Y., has been incorporated by J. T. Berney, F. N. Moses and A. Calleson, 80 Richards Street, Brooklyn, N. Y.

THE ORLAND WATER & LIGHT COMPANY of Springfield, Tenn., has been incorporated with a capital stock of $10,000 by J. W. Drake, W. W. Gilbert, V. E. Crocker, R. L. Porter and H. G. Gilbert.

THE ELECTRIC IRONS, LTD., of Orillia, Ont., has been chartered with a capital stock of $75,000 to manufacture machinery, boilers, electrical equipment, etc. The incorporators are James B. and William H. Tudhope, Robert L. Whitman and others.

THE ELECTRIC TRANSPORT COMPANY of New York, N. Y., has been incorporated by R. Sugden, J. C. Norris and W. A. Anderson, 165 Broadway, New York City. The company is capitalized at $100,000 and proposes to construct and operate underground carriers.

THE ESSENTIAL INDUSTRIES CORPORATION of New York, N. Y., has been incorporated with a capital stock of $3,000,000. The purpose of the company primarily is to finance public utilities, but its activities need not necessarily be confined to this field. Eugene V. R. Thayer, president of the Chase National Bank, is president of the corporation, and Gerhard M. Dahl and Frederick Strauss are vice-presidents.

New England States

NEW MARKET, N. H.—The New Market Electric Company is contemplating raising its dam on the Lamprey River at New Market to a height of 18 ft. above the level of the present dam, increasing the storage capacity of the pond from 45 acres to 550 acres. This will give a dam 30 ft. above the river bed. A new power house will be erected about a quarter of a mile to the east, which will give a fall of 50 ft. and develop 4000 hp. It is proposed to use the excess power over local needs in connection with the plant of the Rockingham Light & Power Company.

BOSTON, MASS.—Plans have been prepared by the New York, New Haven & Hartford Railroad Company for the erection of a two-story signal tower, 20 ft. by 24 ft., on First Street, in the South Boston district.

DANA, MASS.—At a special town meeting held recently the town of Dana voted to appropriate $15,000 for the installation of a municipal lighting system. Electricity to operate the proposed system will be obtained from the Gardner (Mass.) Electric Light Company. A transmission line will be erected to Petersham, where it will connect with the Gardner company's line.

SHELTON, CONN.—Bids, it is reported, are being received by S. Blumenthal Company of Shelton for an addition, 90 ft. by 125 ft., one story, to its power plant. The cost is estimated at about $35,000. G. Aus, 101 Park Avenue, New York, N. Y., is engineer.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 28, under Specification 3515, for electrical wiring, lighting and fixtures in nurses' quarters at the naval hospital.

BROOKLYN, N. Y.—Plans have been prepared by Tobias Goldstone, 50 Graham Avenue, for the erection of an addition, 50 ft. by 50 ft., to the shop of the Electric Welding Company, 744 Graham Avenue, Brooklyn.

BUFFALO, N. Y.—Plans have been filed by the Worthington Pump & Machinery Corporation for alterations and improvements in its transformer station at Clinton and Roberts Streets at the Snow Holly Works, to cost about $5,000. Contract has been awarded to Henry Harder, 287 Northampton Street, Buffalo.

NEW YORK, N. Y.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., is considering the construction and equipment of a new electric shop, to cost about $700,000. Specification 3551.

NEW YORK, N. Y.—Plans have been prepared by W. Whitehill, architect, 39 Union Square, for the erection of a new screen-well house at the power plant of the United Electric Illuminating Company on 203d Street.

NEW YORK, N. Y.—Bids will be received by Scott & Prescott, architects, 1 Madison Avenue, New York, N. Y., until Nov. 2 for construction of base hospital on Tremont Avenue, between Andrews and Montgomery Streets, for the New York Catholic Fund, 334 Fifth Avenue. The cost is estimated at $250,000, and the building will consist of five three-story units.

WADDINGTON, N. Y.—The New York & Ontario Power Company has petitioned the International Joint Commission for permission to reconstruct its dam at Waddington on the St. Lawrence River. The company's project involves two structures on Canadian territory. Its present works are situated on Little River between Ogden Island and on the south shore and south of the international boundary line. The new plans provide for the construction of an embankment from the east end of Ogden Island to Canada Island, crossing the boundary line.

CAMDEN, N. J.—Contract has been awarded by the New York Shipbuilding Corporation to Armstrong & Latta, 119 South Broad Street, Philadelphia, Pa., for the erection of an addition to the pumping station at its plant, to be located at Broadway and Fairview Avenue, to cost about $35,000.

CAPE MAY, N. J.—Plans have been prepared by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for a forge and blacksmith shop, coppersmith works and electrical shop at Cape May.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEWARK, N. J.—Plans are being prepared by the Allweather Train Controller Company, Sumner Avenue and Crane Street, for the installation of a new fire-alarm system in its plant.

NEW BRUNSWICK, N. J.—The erection of a new pumping station at the municipal waterworks is under consideration by the City Council. The building will be located on the Raritan River near Landing Bridge. The cost is estimated at about $150,000.

NEWPORT, N. J.—Plans have been prepared for the erection of a packing house and storage plant for the Staden-Cosier Company, to cost about $150,000.

TRENTON, N. J.—The City Commission is considering opening negotiations with the Trenton & Mercer County Traction Company for the construction of a new branch railway to begin at its West State Street line and to extend through the Sullivan Way tunnel direct to the New Jersey State Hospital for the Insane.

CHAMBERSBURG, PA.—Plans are being prepared by the Chamberland Valley Railroad Company of Chambersburg for the construction of an engine house to cost about $30,000.

ESSINGTON, PA.—The construction of a hydroplane station and plant at Essington, to cost about $400,000, is under consideration by the Ordnance Department. General R. C. Marshall, Jr., construction division, is in charge.

PHILADELPHIA, PA.—A boiler plant, to cost about $50,000, will soon be erected by the Barrett Manufacturing Company, Bermuda and Margaret Streets, Philadelphia.

PHILADELPHIA, PA.—Plans have been prepared by Baugh & Sons, 30 South Delaware Avenue, for the erection of a new boiler plant, 35 ft. by 45 ft., at Morris Street and Delaware Avenue, to cost about $20,000.

PHILADELPHIA, PA.—Contracts have been awarded by the Philadelphia & Reading Railway Company to Charles C. Pace, Merion, for the construction of a one-story and a two-story signal tower and battery building on Erie Avenue, to cost $14,000 and $4,000 respectively; also the erection of two similar buildings at Luzerne Street, to cost $14,500 and $3,500 respectively.

PITTSBURGH, PA.—Work has begun on the construction of the large electric generating plant of the West Penn Power Company to be erected at Springdale, about 15 miles from Pittsburgh, at a cost of about $5,000,000. Contracts, it is understood, have been placed with the Westinghouse Electric & Manufacturing Company for two turbine generators.

PLATSFORD (not a post office), PA.—The construction division of the War Department is planning to erect a gas plant near Platsford, to cost about $2,000,000.

READING, PA.—Plans have been prepared by Muhlenberg Brothers, 513 Penn Street, Reading, for the construction of a power plant for the Carpenter Steel Company at River Road and Exeter Street.

RUTHERFORD, PA.—Contract has been awarded by the Philadelphia & Reading Railway Company to A. L. Carhart, Philadelphia, for the construction of a new engine house and shop at Rutherford, to cost about $100,000.

FAIRFIELD, MD.—Contract has been awarded by the Union Shipbuilding Company to the Hughes Foulkrod Company, Commonwealth Building, Philadelphia, Pa., for an addition to its plant, to cost about $150,000. The company is also having plans prepared for a 700-ft. pier.

INDIAN HEAD, MD.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 28 for coal storage basin (Specification 3208) at Indian Head, to cost about $125,000.

MONKTON, MD.—Work has begun on the construction of the new plant of the Monkton Roller Mills, which will include a hydroelectric power plant, to cost about $30,000, and electrical machinery, $21,000. The cost of the flour mills and machinery is estimated at about $80,000. Otis E. McCoy of Mount Washington, Md., is president of the company.

CHARLESTON, W. VA.—Bids will be received at Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 28, under Specification 3436, for electric traveling crane for F. & F. shop, to cost about $50,000.

MOUNT HOPE, W. VA.—The erection of machine shops and a warehouse, to cost from $75,000 to $100,000 in Mount Hope is under consideration by the New River Company.

ALEXANDRIA, VA.—The City Council is considering an ordinance to grant to a company, yet to be named, a franchise to erect poles and string wires and cables on certain streets of the city.

CAMP STUART, VA.—Extensions and improvements are contemplated by the construction division of the War Department to the base hospital at Camp Stuart, consisting of construction of additional officers' quarters, laboratories, storehouses and alterations to administration building, receiving ward, nurses' infirmary and nurses' quarters. The cost is estimated at $448,200.

RICHMOND, VA.—The Air Reduction Company, 120 Broadway, New York, N. Y., it is reported, has purchased a site in Fulton, on which it proposes to erect a plant, 400 ft. by 100 ft., to manufacture oxygen, nitrogen, acetylene gas and probably storage batteries and other gases.

WALDROP, VA.—The Waldrop Telephone Company, recently incorporated with a capital stock, it is reported, will erect and operate a telephone system (20 miles) in Louisa and Orange Counties.

WASHINGTON, D. C.—The War Department is planning to erect three new power plants on the Ohio River, to be located at Dam No. 24, at Millwood, W. Va.; Dam No. 21, near Morgan, W. Va., and Dam No. 25, near York, W. Va.

WASHINGTON, D. C.—The Washington, Baltimore & Annapolis Electric Railroad Company has awarded contract for block signaling system to be installed over its double-track line between Naval Academy Junction and District Line, near Washington, to the Union Switch & Signal Company. The new installation will protect 36 miles of track and 37 switches.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Annapolis, Schedule 6523½—two electric motors. Brooklyn, Schedule 6527½—motor-driven surfacers. Boston, Mass., Schedule 6537½—switches and levers. Eastern navy yards, Schedule 6545½—signaling keys, condensers and 500 searchlights. Submarine base, Conn., Schedule 6562½—motor-generator sets, transformers and voltmeters. Puget Sound, Schedule 6569½—one boiler-feed pump. New London, Conn., Schedule 6571½—1200 flashlights. Mare Island, Schedule 6573½—underwriters' lighting cable and switchboard wire. South Charleston, Schedule 6589½—charging machines. Applications for proposals should designate the schedule desired by number.

WASHINGTON, D. C.—Plans are being prepared by the Bureau of Yards and Docks, Navy Department, for work at the various navy yards for which bids will be called for at some future time. Mare Island, Cal., Specification 3240—electric traveling crane for structural shop; Specification 3561—electrical storehouse (bids to be opened at the yard). Newport, R. I., Specification 3250—widening and lighting slips. Hampton Roads, Specification 3300—coal-handling machinery. Montauk, L. I., Specification 3338—underground wiring. Bellevue, D. C., Specification 3372—electric crane. Norfolk, Specification 3377—electric light and power system and steel storage building; Specification 3380—cranes for galvanizing plant; Specification 3546—two radio buildings. Philadelphia, Pa., Specification 3345—machinery and electric shop; Specification 3420—wood-block floors, structural shop, smithery, machine and electric shop. Pensacola, Fla., Specification 3389—power plant improvements. Rockaway, L. I., Specification 3415—electric power service (bids opened at the yard). New York, Specification 3438—electric traveling crane in structural shop; Specification 3551—light machine and electric shop; Specification 3565—fire and water alarm systems, building 3, Great Lakes, Ill., Specification 3458—power house; Specification 3475—three drill halls and two power houses. Boston, Mass., Specification 3477—electric traveling crane for extension to machine shop and foundry building No. 2. Portsmouth, N. H., Specification 3502—two cranes for machine-shop extension. Miami, Fla., Specification 3507—extension to motor test stand. Applications for proposal blanks should designate the schedule desired by number.

North Central States

DETROIT, MICH.—Plans have been prepared for an addition to the plant of the Aluminum Castings Company, Campau Avenue, to cost about $150,000.

DETROIT, MICH.—Plans are being prepared for the erection of an addition to the plant of the Detroit Copper & Brass Rolling Mills, Clark Avenue, to cost about $350,000.

DETROIT, MICH.—The Hudson Motor Company is planning an addition to its plant, 60 ft. by 460 ft., to cost about $60,000. The building, it is understood, will be used for making shells.

LANSING, MICH.—An agreement has been reached between the city of Lansing, the creditors of the Michigan Power Company and Judge Arthur J. Tuttle whereby the city of Lansing will take over the property of the Michigan Power Company and combine it with the municipal electric service.

MANISTIQUE, MICH.—The Manistique Pulp & Paper Company is contemplating extensions and improvements to its plant, involving an expenditure of more than $500,000. The work will be done by day labor under the supervision of H. J. Storer, consulting engineer.

MASSILLON, OHIO.—Work will soon begin on the construction of the addition to the power house of the Massillon Electric & Gas Company on South Erie Street, to cost between $35,000 and $40,000. The extension will be used to take care of the energy received from the transmission line from Canton, which the plant is at present unable to use. The plant which the company was to have built at Bolivar will be erected at some future time.

YOUNGSTOWN, OHIO.—Plans have been prepared by C. D. Cooley & Company, architects, Century Building, Pittsburgh, Pa., for the construction of a bakery for the Youngstown Bread Company.

CONCORD, KY.—Contract has been awarded by the Chesapeake & Ohio Railroad Company to Roberts & Shaefer Company, 332 Michigan Avenue, Chicago, Ill., to build an electric locomotive coaling plant of 500 tons capacity.

MANNINGTON, KY.—The Memphis Coal Mining Company is planning to build a power house and two electrically equipped coal tipples, also to install a number of large motors.

FORT WAYNE, IND.—Preparations are being made for the installation of a 725-hp. boiler in the municipal electric light plant. Contract for the work, it is understood, has been awarded.

FORT WAYNE, IND.—Contract has been awarded to the Crowell-Lundorff-Little Company of Cleveland, Ohio, for the erection of new buildings for the Pennsylvania Railroad Company in Fort Wayne, to cost about $280,000.

INDIANAPOLIS, IND.—Work will soon begin on the erection of new buildings at Fort Benjamin Harrison, to cost about $2,500,000. An administration building is included in the plans.

PETERSBURG, IND.—The Pike Coal Company, of Petersburg, it is reported, is planning to rebuild its coal tipple and replace machinery recently destroyed by fire.

GREAT LAKES, ILL.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 28, under Specification 3550, for construction of two storehouses and power house, to cost about $250,000.

APPLETON, WIS.—The Langstadt-Meyer Company of Appleton has leased the building formerly occupied by the Appleton Motor Car Company and will install new equipment for production of direct-connected electric generating units for shops and farm purposes. The company manufactures electrical appliances, farm lighting systems, etc.

PESHTIGO, WIS.—Contract, it is reported, has been awarded by the Oconto Service Company for the construction of dam to the Jorgensen Construction Company of Denmark, to cost about $25,000.

SHEBOYGAN FALLS, WIS.—Contract has been awarded by the Falls Motor Corporation to the Immel Construction Company of Fond du Lac for the construction of an addition, 120 ft. by 272 ft., one story, at its plant. The company manufactures gasoline engines.

LITTLE FALLS, MINN.—The Little Falls Water Power Company has awarded contract to Siems, Helmers & Schaffner of St. Paul for the construction of a concrete spillway for dam, to cost about $80,000.

ROCHESTER, MINN.—Plans are being considered by the State Board of Control for the construction of a new power plant at Rochester, Minn.

ST. JOSEPH, MO.—Contract for electrical work in the new store building of the Townsend & Uberrheim Clothing Company has been awarded to the American Electrical Company of St. Joseph.

ST. LOUIS, MO.—The Polar Wave Ice & Fuel Company is contemplating the erection of an ice-manufacturing plant at 4735 Eastern Avenue, to cost about $200,000. H. G. Clymer, Wainwright Building, St. Louis, is architect.

YORKTOWN, IOWA.—At an election held recently the proposal to grant a franchise for the installation of an electric lighting system was carried.

FREMONT, NEB.—At the request of the National Fuel Administration arrangements have been made whereby the generating plant of the Fremont Gas, Electric Light & Power Company will close down during the war and electricity to operate its system will be purchased from the municipal electric plant.

Southern States

CHARLESTON, S. C.—Contract has been awarded by the Charleston Consolidated Railway & Lighting Company for improvements to its plant to the J. A. P. Crisfield Contracting Company, Graves Lane, Philadelphia, Pa. The proposed work will cost about $750,000 and will include doubling the capacity of the Charlotte Street electric generating station as well as transmission system, etc.

GLENN SPRINGS, S. C.—A charter recently granted the Glenn Springs Corporation gives the company the right to further develop Glenn Springs mineral water property, to construct and operate railways and electric light plants, hotels, etc. The company is capitalized at $100,000. The incorporators are Julian Calhoun and L. W. Perrin, both of Spartanburg.

JACKSONVILLE, FLA.—The Armour Fertilizer Works would like to receive catalogs and prices on direct-current motor and generator supplies, engines, blowers, engine and boiler room supplies, pumps, etc. B. Winford Bahl of Jacksonville is chief engineer.

GREENVILLE, MISS.—Bids will be received by the Black Bayou Drainage District until Dec. 10 for furnishing and installing two drainage pumps with combined capacity of 80,000 gal. per minute against low heads; also supplementary machinery and appurtenances. The Morgan Engineering Company, Goodwyn Institute Building, Memphis, Tenn., has charge of the engineering work.

FAYETTEVILLE, ARK.—The City Council is considering the installation of an electrically driven pump at the White River pumping station.

NEW ORLEANS, LA.—The Crescent Stock Yard & Slaughter House Company is planning to rebuild two cooling plants, machine shop and shipping shed, recently destroyed by fire, causing a loss of about $200,000.

OKMULGEE, OKLA.—Contract has been awarded by the city of Okmulgee for construction of waterworks and sewer systems as follows: For general construction of power house, dam, intake, basins, reservoir, etc., to Tibbetts & Pleasant, Tulsa, at $135,200; pumping machinery, steam-power plant, engine and generator and erection of machinery in power plant to the E. J. Merkle Machinery Company, Kansas City, Mo., at $68,200. The equipment will include two boiler-feed pumps, two 150-hp. water-tube boilers, heaters, one 100-kva. engine-driven generating unit with switchboard. The transmission lines will also be rebuilt. Burns & McDonnell, Interstate Building, Kansas City, Mo., are engineers.

Pacific and Mountain States

HOQUIAM, WASH.—The City Commissioners are considering replacing the gas lamps at each street corner with electric lamps. About thirty-four electric lamps will be installed.

SEATTLE, WASH.—Permit has been granted to the Skinner & Eddy Shipbuilding Corporation for the construction of a power house at 1201 Railroad Avenue, South, to cost about $20,000.

SEATTLE, WASH.—An ordinance is before the City Council authorizing an issue of $1,750,000 for extensions and permanent improvements to the municipal lighting installation. It is proposed to take up the light department warrants, issued to pay for permanent improvements, build the Spokane and Ballard Street substations, pay for the proposed connection of the municipal and the Puget Sound Traction, Light & Power Company's power plants, and to provide a fund to cover extensions for the next three years.

TACOMA, WASH.—The development of a storage basin for the municipal hydroelectric plant at La Grande is under consideration by the City Council. The site of the proposed impounding basin was selected by H. F. Gronen, commissioner of light, and is said to be the only one available of sufficient capacity in the Nisqually watershed. The cost is estimated at $500,000. This additional water will enable the city to double the output of the municipal electric plant. Additional loads in sight for the municipal plant, which it will not be able to handle with its present capacity during the low-water period next year, include that of lighting Camp Lewis, American Lake Cantonment, near Tacoma, which will be taken over No. 1.

FLORENCE, ORE.—Plans are being prepared by the Florence Mill, Power & Light Company, recently incorporated, for a sawmill. The company is capitalized at $30,000.

PORTLAND, ORE.—The Pacific Power & Light Company is installing additional equipment at its reserve power plant in Astoria, consisting of a 700-hp. steam engine directly connected to a 750-kva. generator, increasing the output of the plant to 1600 kva. Orders have been placed by the Hammond Lumber Company of Astoria for equipment for a steam-driven electric generating plant, consisting of Erie City boilers of 1800 hp., a 1500-kw. turbogenerator, a Beyer barometric condenser, a 3000-hp. Cochrane feed-water heater and auxiliaries. The output of the plant will be sold to the Pacific Power & Light Company, and will be distributed by it to shipyards and other industries in this vicinity.

SACRAMENTO, CAL.—All bids submitted for equipment for an electrically driven pumping unit at the city waterworks station have been rejected by the City Council.

SAN FRANCISCO, CAL.—A plan to increase the supply of electrical energy available in this district by 100,000 kw. by an expansion of its present hydroelectric system, and which it is estimated will cost $15,000,000, has been recommended, it is reported, to the War Industries Board by Major George F. Sever, who is investigating power conditions in the West. The project includes, it is said, the completion of the Drum development of the Pacific Gas & Electric Company on the Feather River, the heightening of the dam of the Great Western Power Company at Great Meadows and the construction of an additional power house on the system of the San Francisco-Sierra Power Company on the Stanislaus River at a point where it makes a drop of 1200 ft., and an expansion of the Sheep Rocks project on the Pitt River.

PETERSBURG, COL.—The power house of the National Alfalfa Products Company of Petersburg, between Petersburg and Littleton, was recently destroyed by fire.

Canada

TORONTO, ONT.—The date for receiving tenders for the four 52,500-hp. turbines for the Chippewa-Queenston power development of the Ontario Hydro-Electric Power Commission has been extended to Nov. 1.

MONTREAL, QUE.—Capitalists, represented by M. J. O'Brien of Renfrew, Ont., and Quinlan & Robertson, contractors, are negotiating with the city authorities regarding the establishment of a hydraulic power plant to develop about 40,000 hp. from the Rivière des Prairies, a short distance from this city. The cost of the proposed plant is estimated at about $12,000,000.

ROSTHERN, SASK.—The Water Commissioners are planning to install additional electrical equipment at the power house for lighting purposes.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Nov. 6 for furnishing, under Circular No. 1234, copper wire and cable, electrical supplies and fixtures, conduit, laboratory instruments, etc. For further information address the above office.

1,278,964. RECORDING DEVICE FOR SPEEDOMETERS AND OTHER PURPOSES; Charles F. MacGill, Cambridge, Mass. App. filed July 26, 1917. Graphic record of speed variations for a motor car; may be made to cover any interval of time.

1,278,966. CIRCUIT INTERRUPTER; Joseph N. Mahoney and Howard G. MacDonald, Wilkinsburg, Pa. App. filed Nov. 28, 1913. Has single, compact operating mechanism which may be installed in front of any two adjacent poles, and also combined accelerating and retarding device insuring rapidly opening circuit breaker free from jars and shocks.

1,278,967. CIRCUIT INTERRUPTER; Joseph N. Mahoney, Wilkinsburg, and Walter M. Austin, Swissvale, Penn. App. filed Aug. 7, 1914. Decreases current in winding of closing, holding and tripping electromagnet of circuit interrupter after contact members of same are engaged.

1,278,982. CONTROL SYSTEM FOR ELECTRIC ARC WELDING MECHANISM; Harry D. Morton, Detroit, Mich. App. filed Feb. 21, 1917. Equilibrium is automatically maintained within any desired limit to control rate at which welding strip is fed to arc.

1,278,983. AUTOMATIC ARC-WELDING MACHINE; Harry D. Morton, Detroit, Mich. App. filed March 2, 1917. For automatically feeding welding strip or wire into and away from arc of automatic metallic electrode arc-welding machine.

1,278,984. METHOD OF AND MEANS FOR ELECTRIC ARC WELDING; Harry D. Morton, Detroit, Mich. App. filed March 2, 1917. Increase and decrease of resistance in welding circuit is not directly dependent on current in welding circuit.

1,278,985. PORTABLE ELECTRIC ARC-WELDING APPARATUS; Harry D. Morton, Detroit, Mich. App. filed March 2, 1917. Automatically welds parts of large structures such as buildings, ships, railroad cars and boilers.

1,278,993. ELECTRICAL COIL AND METHOD OF WINDING SAME; Edward F. Parks, Providence, R. I. App. filed March 15, 1917. Scoring or creasing paper or other material provides raised shoulders or finlike ridges to prevent displacement of wire.

1,278,997. SUPPORTING BRACKET FOR ELECTRICAL INSTRUMENTS; Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. App. filed Oct. 15, 1915. Supply of current to instrument is automatically cut off when instrument is supported on bracket and not in use.

1,279,005. COOKING APPARATUS; William F. Roos, Mamaroneck, N. Y. App. filed Jan. 2, 1918. Apparatus may be reversed for supplying either top or bottom heat, and any radiation or waste of heat during parboiling or sweating operation is prevented.

1,279,009. POLYPHASE GENERATOR WITH TUNED SPARK GAP; Lucien Rouze, Paris, France. App. filed Jan. 8, 1915. Increases number of discharges per second height of sound while maintaining lower frequencies.

1,279,012. CENTRIFUGAL SWITCH; Harold M. Schiebe, Wilkinsburg, Pa. App. filed June 5, 1913. Has reference to starting means for fan motors of the single-phase induction type.

1,279,020. FUSE DEVICE; Edmund O. Schweitzer, Chicago, Ill. App. filed April 21, 1913. Externally controlled fusible cut-out has a casing of insulating material provided with annular terminals and supplementary terminals passing through extremities of casing.

1,279,074. BATTERY SEPARATOR; Frank T. Baird, Blue Island, Ill. App. filed Nov. 19, 1917. Formed by sawing tripoli in its native state into slabs or sheets.

1,279,095. SAFETY APPLIANCE; Edgar T. Eaves, Rawlins, Wyo. App. filed Feb. 16, 1916. Automatically operates block signal or semaphore to danger position upon breakage of switch points to sidetrack train from main line.

1,279,111. DILATOR; John G. Homan, Steubenville, Ohio. App. filed Sept. 24, 1917. Excites the nerves and stimulates capillary blood vessels.

1,279,113. ELECTROMAGNETIC AIR-BRAKE VALVE; Edward R. Humphrey, Victoria, B. C., Canada. App. filed Feb. 6, 1918. Air for service and emergency application and release controlled by use of only two magnets.

1,279,120. ELECTROTHERAPEUTICAL CHAIR; John H. Kellogg, Battle Creek, Mich. App. filed Dec. 5, 1916. Some electrodes for supporting various portions of body are adjustable relatively to the others.

Record of Electrical Patents

Notes on United States Patents

1,279,146. ELECTRIC FURNACE; Samuel Peacock, Philadelphia, Pa. App. filed March 1, 1918. Adapted for laboratory and other uses.

1,279,168. ELECTROMAGNETIC SWITCH MECHANISM; Guy B. Smith, New York, N. Y. App. filed Jan. 26, 1915. Pair of switches effect the operation singularly and selectively by means of single operating magnet.

1,279,178. TELAUTOGRAPHIC SYSTEM; George S. Tiffany, Summit, N. J. App. filed May 2, 1916. Movements of receiving pen effected by local source of energy, only work performed by main-line currents being that of controlling these circuit connections.

1,279,179. CANDLE SOCKET; Arthur J. Tizley, Brooklyn, N. Y. App. filed Oct. 30, 1916. Few special parts in switch need be manufactured.

1,279,192. ELECTRODE; Frank C. Wheeler, Appleton, Wis. App. filed July 21, 1916. Designed especially for use as an anode in the electrolysis of chloride solutions, although susceptible of use in many other relations.

1,279,204. HEADLIGHT; Overton Winston, Minneapolis, Minn. App. filed May 31, 1916. Improved arrangement of contact device in socket and on shank of two-filament electric light bulb.

1,279,244. PROTECTOR FOR THE TIMERS OF AUTOMOBILE ENGINES; Monna R. Brugman, Windsor, Ohio. App. filed Oct. 2, 1917. To prevent short-circuiting by oil and muddy water splashing on timer and adjacent wires.

1,279,252. RESISTANCE ELEMENT; John A. Capp, Schenectady, N. Y. App. filed April 18, 1916. Alloy of iron, nickel and manganese is used.

1,279,256. CONDUIT CONNECTION; Albert Casper, Vallejo, Cal. App. filed April 17, 1917. Can be readily connected without use of locknuts and may also serve as a closure for knock-out openings.

1,279,279. SECONDARY BATTERY; Henry Csanyi, New York, N. Y. App. filed Feb. 27, 1917. Accidental spilling and consequent loss of battery solution is prevented and necessity of frequently refilling cell is obviated.

1,279,280. SECONDARY BATTERY CELL; Henry Csanyi, New York, N. Y. App. filed Feb. 27, 1917. To dispense with sulphuric acid or alkali ordinarily employed in battery cells instead of chloride.

1,279,283. METHOD OF AND APPARATUS FOR ELECTRICAL DISTRIBUTION; Alfred H. Darker, Blackheath, England. App. filed March 18, 1910. Complicated automatic regulating means in electric lighting systems of constant-current type and constant-voltage type eliminated.

1,279,305. IGNITION TESTER; John L. East, Jr., Claudell, Kan. App. filed June 19, 1917. Spark plugs can be tested in circuit with timer of motor vehicle before being placed in engine.

1,279,313. ELECTRICAL HEATING FURNACE; Herman V. Finnie, St. Catharines, Ontario, Canada. App. filed May 10, 1918. To treat shells or other tubular structures electrically so that they will be rapidly and uniformly heated.

1,279,321. ELECTRICALLY HEATED SOLDERING IRON; Benjamin F. Gardner, Chicago, Ill. App. filed Jan. 19, 1916. Accurate automatic regulation of the heat developed is obtained in resistor.

1,279,342. TELEPHONE DISINFECTOR; Louis S. Hershberger, Smithburg, Md. App. filed March 28, 1917. Elements of device are so arranged as not to interfere with operation of telephone to which it is attached.

1,279,344. BURGLAR-ALARM SYSTEM; Simon B. Hesse, New York, N. Y. App. filed June 3, 1915. To avoid possibility of defeating system by tampering with circuit-controlling apparatus.

1,279,352. IMPULSE TRANSMITTER; Alexander E. Keith, Hinsdale, Ill. App. filed Dec. 24, 1917. Use of inherently lubricant material reduces abrasion of various parts of mechanism.

1,279,360. MOTOR-CONTROL SYSTEM; Willem C. Korthals-Altes, Schenectady, N. Y. App. filed March 16, 1918. Pilot motor used for varying speed of main motor is promptly brought to rest by dynamic braking action.

1,279,363. ELECTRICAL AIR HEATER; Frank Kuhn and Jay A. Hand, Detroit, Mich. App. filed Feb. 21, 1918. May be placed under hood of automobile to prevent undesirably low temperatures and is protected from overheating.

1,279,364. PORTABLE COOK STOVE; Frank Kuhn, Detroit, Mich. App. filed April 6, 1918. Size assures ready portability, and yet full amount of heat necessary to use of ordinary cooking utensils is furnished.

1,279,378. MAXIMUM-DEMAND RECORDER; George D. Pogue, St. Louis, Mo. App. filed Nov. 20, 1917. Simply constructed and does not frequently require services of attendant.

1,279,380. MISFIRING-TESTING DEVICE FOR MULTIPLE-CYLINDER ENGINES; Matt B. Thurber, Tecumseh, Neb. App. filed Oct. 21, 1914. Is applied to insulated electrodes of spark plugs in all cylinders except the one to be tested and is also connected with body of engine.

1,279,392. ELECTRICAL DISTRIBUTING SYSTEM; Vittorio Martinetto, Turin, Italy. App. filed Jan. 4, 1916. Provides total or partial working reserve which is instantly available should sudden failure in transmission of power from main source take place.

1,279,393. SIGNALING APPARATUS; Jesse L. Mayberry, New York, N. Y. App. filed Nov. 30, 1915. Enables driver of automobile to show when he intends to turn to right or left or to stop.

1,279,404. TIRE-WRAPPING MACHINE; Howard I. Morris, San Diego, Cal. App. filed Nov. 18, 1916. Peripheral segment of roll-carrying shuttle may be readily removed and replaced for changing tires.

1,279,405. TIRE-WRAPPING MACHINE; Howard I. Morris, San Diego, Cal. App. filed Dec. 1, 1916. Means for driving and stopping shuttle facilitate adjustment of tires and increase production.

1,279,415. ELECTRIC LAMP; John A. Orange, Schenectady, N. Y. App. filed Sept. 12, 1914. Combination arc and incandescent lamp containing gaseous atmosphere, electrodes being so proportioned that advantages of gaseous atmosphere at relatively considerable pressure in an incandesent lamp may be secured in lamps of very small rating.

1,279,423. X-RAY TARGET; Carl A. Pfanstiehl, Highland Park, Ill. App. filed Sept. 25, 1916. Disk of polished tungsten is connected with its electrode body of copper so that very rapid conduction of heat will occur between tungsten and electrode body.

1,279,426. ELECTRICAL ATTACHMENT PLUG; Johann G. Peterson, Jersey City, N. J. App. filed Nov. 23, 1917. Means provided for interlocking contacts to prevent their accidental separation.

1,279,427. ELECTRICAL ATTACHMENT PLUG; Johann G. Peterson, Jersey City, N. J. App. filed Jan. 24, 1918. To be used in conjunction with certain types of electrical appliances.

1,279,437. ELECTRIC SWITCH; Arthur E. Read, New York, N. Y. App. filed Sept. 12, 1917. Color of portion of push-button shank visible shows when circuit is open or closed.

1,279,472. COMPRESSION-OPERATED IGNITION DEVICE; Warren F. Stanton, Pawtucket, R. I. App. filed Nov. 9, 1916. Adapted for internal-combustion engines, pumps and other devices.

1,279,484. TELAUTOGRAPHIC SYSTEM; George S. Tiffany, Summit, N. J. App. filed July 22, 1916. Overcomes difficulty in controlling motor-generator in alternating-current systems.

1,279,489. TELEPHONE-EXCHANGE SYSTEM; Frederick E. Anderson, Newark, N. J. App. filed Jan. 8, 1918. Relates to systems employing trunk circuits extending from operators' positions of switchboard to chief operators' desks, information and supervisory operators' positions and like positions.